ASM-20

Synchronous/Asynchronous Short Range Modem
Installation and Operation Manual

Notice

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Warranty

This RAD product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, RAD will, at its option, either repair or replace products which prove to be defective. For warranty service or repair, this product must be returned to a service facility designated by RAD. Buyer shall prepay shipping charges to RAD and RAD shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties and taxes for products returned to RAD from another country.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied firmware or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

Exclusive Remedies

The remedies provided herein are the Buyer's sole and exclusive remedies. RAD shall not be liable for any direct, indirect special, incidental, or consequential damages, whether based on contract, tort, or any legal theory.

Safety Warnings

The exclamation point within a triangle is intended to warn the operator or service personnel of operation and maintenance factors relating to the product and its operating environment which could pose a safety hazard.

Always observe standard safety precautions during installation, operation and maintenance of this product. Only a qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this instrument. No adjustment, maintenance or repairs should be performed by either the operator or the user.

Telecommunication Safety

The safety status of each of the ports on the ASM-20 is declared according to EN 41003 and is detailed in the table below:

Ports	**Safety Status**	
V.24, V.35, V.36, X.21, RS-530, LAN	SELV	Circuit operating with Safety Extra-Low Voltage
G.703, LINE	TNV-1	Circuit whose normal operating voltage is within the limits of SELV, on which overvoltages from Telecommunications Networks *are* possible.

Regulatory Information

FCC-15 User Information

This equipment has been tested and found to comply with the limits of the Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to the radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Warning per EN 55022

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

Declaration of Conformity

Manufacturer's Name: RAD Data Communications Ltd.

Manufacturer's Address: 12 Hanechoshet St.
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Israel

declares that the product:

Product Name: **ASM-20**

Conforms to the following standard(s) or other normative document(s):

EMC:	EN 55022 (1994)	Limits and methods of measurement of radio disturbance characteristics of information technology equipment.
	EN 50082-1 (1992)	Electromagnetic compatibility - Generic immunity standards for residential, commercial and light industry.
Safety:	EN 60950 (1992/93)	Safety of information technology equipment, including electrical business equipment.

Supplementary Information:

The product herewith complies with the requirements of the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC. The product was tested in a typical configuration.

Tel Aviv, October 10, 1996

Haim Karshen
VP Quality

European Contact: RAD Data Communications GmbH, Lyoner Strasse 14, 60528 Frankfurt am Main, Germany

Quick-Start Guide

1. Installing and Operating ASM-20

If you are familiar with ASM-20, use this guide to prepare it for operation. Perform the following steps for both the local and the remote units.

1. Disconnect all cables from the units.
2. Open the units.
3. Adjust the jumpers. See *Chapter 2, Installation and Setup*.

Note *Make sure that there is only one clock source in the application: one modem INT or EXT and the other modem RCV (LBT).*

4. Configure the DTE parameters. See *Chapter 2, Installation and Setup*.
5. Configure the line parameters. See *Chapter 2, Installation and Setup*.
6. Close the units.
7. Connect the units to the DTEs.
8. Turn on the units.
9. Connect the units to the line.
   The units should begin operating within a few seconds.

Preface

Foreword

This manual provides information on the technical characteristics, installation and operating instructions of ASM-20. The manual contains the following information:

Chapter 1. Introduction
describes ASM-20 and its applications, features, options, physical and functional descriptions and technical specifications.

Chapter 2. Installation
describes the information required to implement the mechanical and electrical installation of the ASM-20 standalone model, including the information for setting the jumpers and switches.

Chapter 3. Operation
describes the controls and indicators of ASM-20 and their functions. It introduces operation and self test procedures of ASM-20.

Chapter 4. Troubleshooting and Diagnostics
describes the procedures for performing system diagnostic tests for ASM-20.

Chapter 5. Card Cage Version
describes the card cage version of ASM-20.

Appendix A. Ethernet Interface
describes the IR-ETH for RAD modems, the different IR-ETH connector options, the Ethernet bridge specifications, and how to install and operate an Ethernet bridge.

Appendix B. IR-G.703 Codirectional Interface (64 kbps)
describes the IR-G.703 codirectional interface (64 kbps) and the EXT and INT/RCV modes.

Appendix C. IR-X.21B Interface Module
describes the IR-X.21B interface module, the connectors and pin assignments and the EXT and INT/RCV modes.

Appendix D. DTE Interface Connectors
describes the interface signal list (female connectors) pins and standard signal names.

Appendix E. Connection to RS-422
describes detailed information for connecting an ASM-20 (EIA 530) to a RS-422 (V.36) DTE.

Appendix F. Unit Case Assembly
details installation into a 19″ rack.

Conventions

Note	*A note draws attention to a general rule for a procedure, or to exceptions to a rule.*
Caution	A caution warns of possible damage to the equipment if a procedure is not followed correctly.
 ***Warning***	**A warning alerts to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the equipment. If these instructions are not followed exactly, possible bodily injury may occur.**

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Chapter 1
Introduction

1.1 Overview

The ASM-20 Short Range Modem operates synchronously or asynchronously at full or half duplex, over unconditioned lines. ASM-20 has a range of up to 23 km (14 miles) and operates at selectable data rates from 19.2 kbps to 256 kbps.

ASM-20 uses conditioned diphase modulation (EUROCOM Std. D1) to provide immunity from background noise, eliminate normal line distortion and enable efficient transmission and reception of serial data over a twisted pair cable.

Transmit timing is provided internally, or derived externally from the data terminal or regenerated from the receive signal.

Receive timing is regenerated from the data.

Applications

The following diagrams illustrate ASM-20 in a variety of configurations:

- Point-to-point applications (see *Figure 1-1*)
- Modem link application (see *Figure 1-2*)
- Tail-end for digital networks application (see *Figure 1-3*).

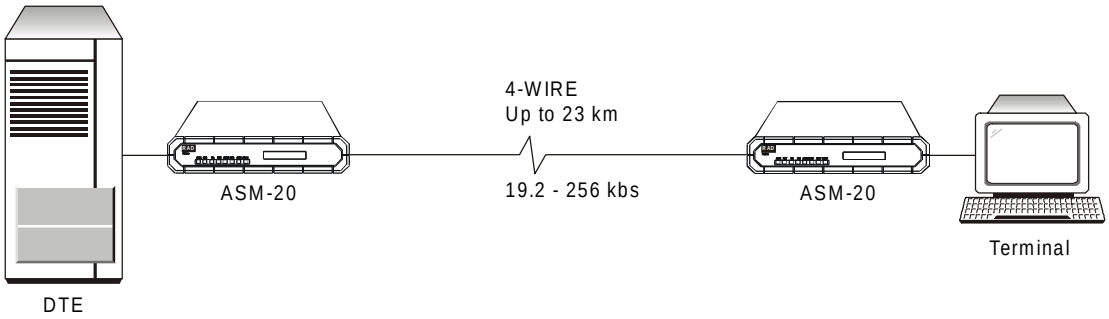


Figure 1-1 Point-to-point Application

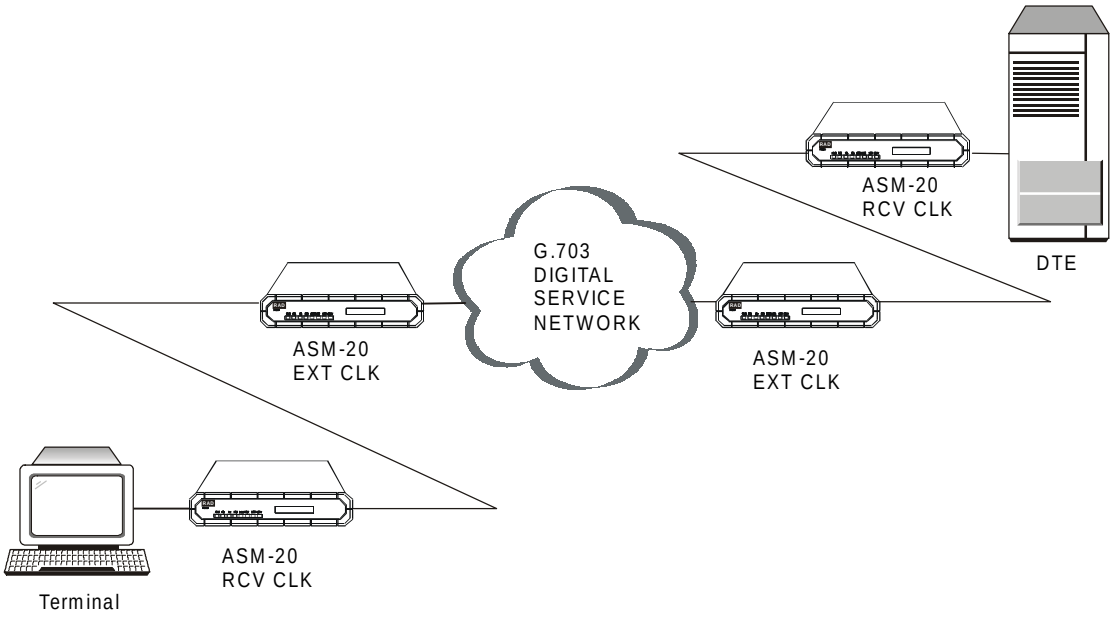


Figure 1-2 G.703 Modem Link Application

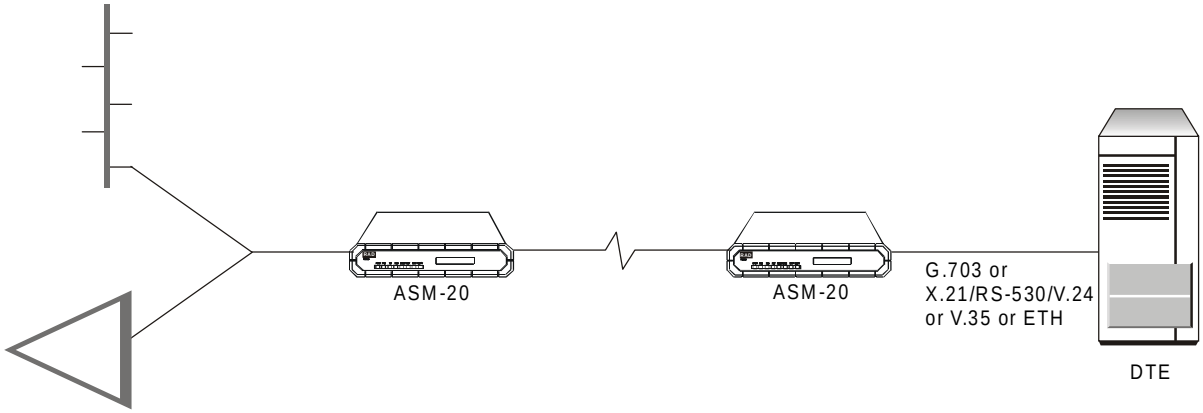


Figure 1-3 Tail-end for Digital Network Application

Features

ASM-20 features V.54 diagnostic capabilities for performing local analog loopback and local and remote digital loopback. The operator at either end of the line may test both modems and the line when in digital loopback mode. The loopback is controlled by either front panel push buttons or via the DTE interface.

Options

The following DTE interface options are available:

- V.24/RS-232(up to 64 kbps)
- V.35
- X.21
- RS-530
- V.36
- G.703 (64 kbps co-directional)
- Built-in Ethernet bridge.

Connection to an RS-449/V.36 interface is accomplished via the RS-530 interface (see *Appendix A, Ethernet Interface*). ASM-20 incorporates a built-in Bit Error Rate Tester (BERT). The internal BERT allows complete testing of both modems and the line without external test equipment. A front panel switch generates a pseudo-random test pattern (511-bit, according to ITU/V.52) for testing end-to-end connectivity. The ERROR LED will flash when a bit error is encountered.

1.2 Physical Description

ASM-20 is available as a desk-top unit or a rack-mountable card for a 19" rack. The rack can carry up to 14 ASM-20 cards which provide a 25-pin D-type connection to the digital interface. Optional interface adapters for V.35, X.21, G703 and ETH are available. The ASM-20/R card can detect and indicate power failure on the remote ASM-20 standalone unit. The RPF LED will light up if remote power failure occurs.

Front Panel

Figure 1-4 shows a general view of ASM-20.

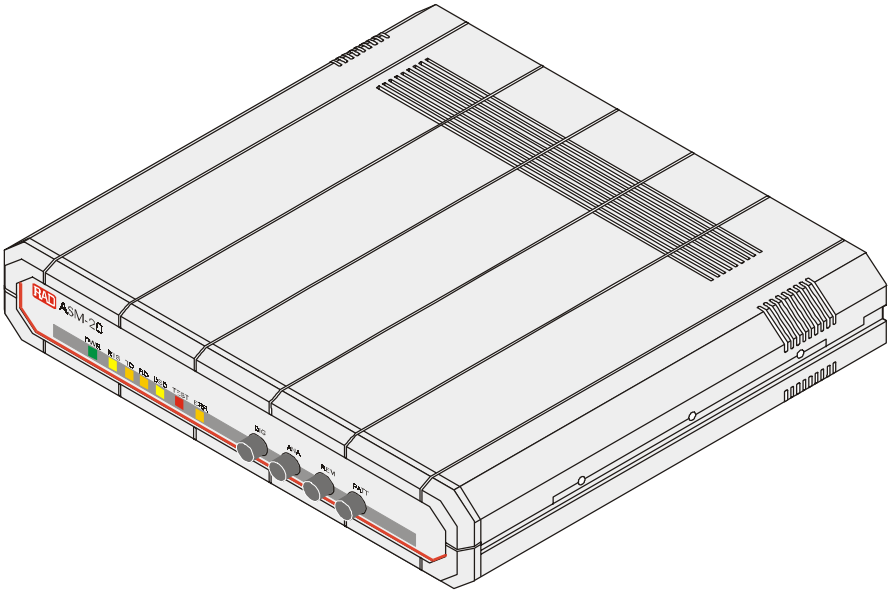


Figure 1-4 ASM-20, General View

LEDs

All controls (push button and LED indicators are located on the ASM-20 front panel (see *Figure 1-4*). A description of the front panel can be found in *Controls and Indicators* in *Chapter 3*.

Jumpers

A description of the jumpers can be found in *Setting Internal Jumpers and Switches* in *Chapter 2*. See *Table 2-1* and *Figure 2-3*.

Rear Panel

Figure 1-5 shows an example of an ASM-20 rear panel. A description of the rear panel can be found in *Electrical Installation* in *Chapter 2*.

The line and interface connectors are located on the rear panel of ASM-20 (see *Figure 1-5*).

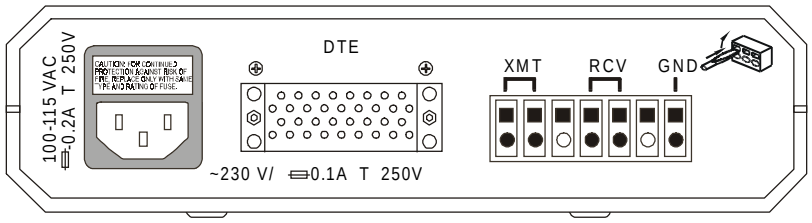


Figure 1-5 ASM-20 Rear Panel with V.35 Interface

1.3 Functional Description

This section contains functional descriptions of the circuit blocks in ASM-20, primarily those circuits which are required for configuring the modem (see *Figure 1-6*).

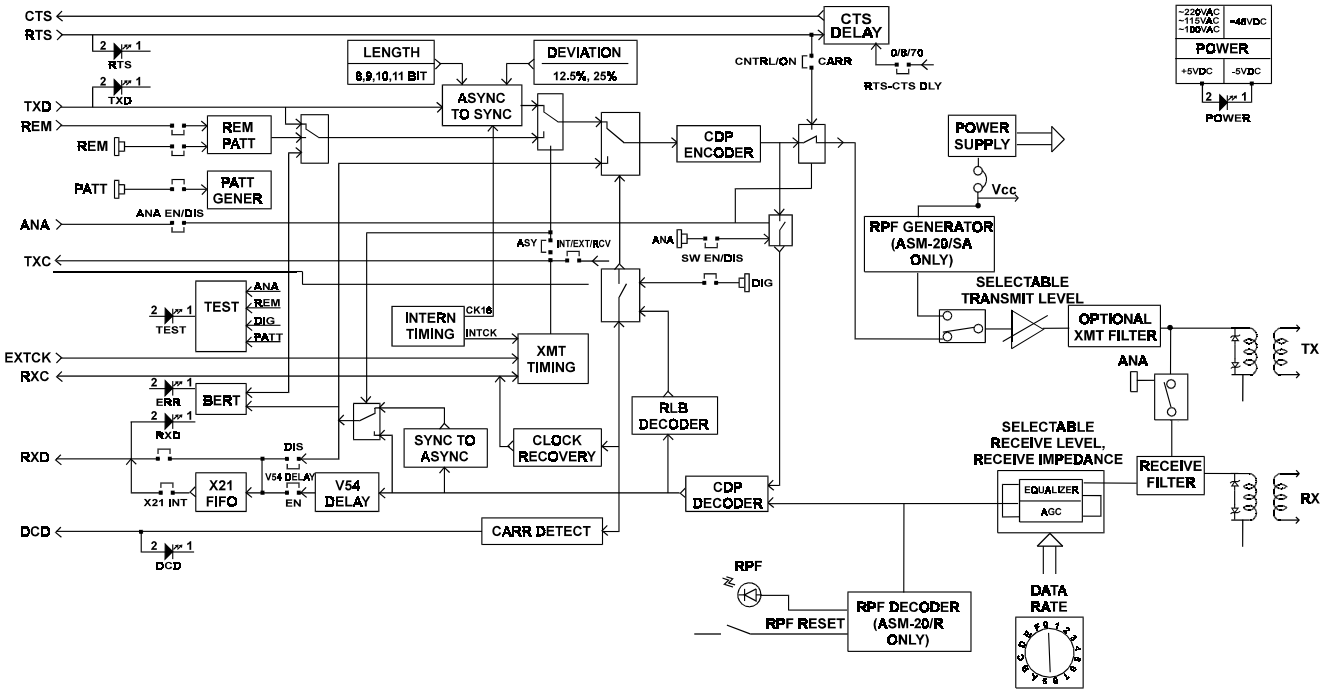


Figure 1-6 ASM-20 Block Diagram

Encoder

The encoder receives data from the DTE, then modulates the data using the CDD "conditional diphase modulation" technique.

- 4-wire full duplex
- 4-wire half duplex.

Modulation Timing

This circuit supplies the transmit clock to the encoder. Three clock sources are available:

- Internal oscillator
- External from the DTE
- Loop clock derived from the receive signal.

Setting the XMT CLK jumper determines the timing option. See *Setting Internal Jumpers and Switches* in *Chapter 2* for more information.

XMT Level (optional)

Two options are available for the XMT level (signal level): 0 and -6 dBm. XMT level is controlled by the XMT LVL jumper. See *Setting Internal Jumpers and Switches* in *Chapter 2* for more information on the XMT LVL jumper.

An optional output filter to the line is available. This filter can be ordered in compliance with British Telecom and other PTT requirements.

Receiver

The receiver comprises several circuits as shown in the block diagram (see *Figure 1-6*):

- The RECEIVE FILTER removes all the out-band frequencies.
- The AUTOMATIC EQUALIZER comprises several equalizers which are activated according to baud rate.
- The digital AGC automatically compensates for the attenuation of the line.

Remote Power Failure (RPF)

The Remote Power Failure feature allows the user at a central location to detect a power failure in a remote modem. The remote power failure feature can only be configured when the ASM-20/SA standalone unit (remote) operates opposite the rack-mounted card ASM-20/R (central). When a power failure occurs, ASM-20/SA transmits a special tone which is detected by ASM-20/R and causes the ERR/RPF LED to light up. A special push button located on the front panel of ASM-20/R allows the user to reset the RPF LED. The RPF jumper in the standalone unit enables or disables the feature. The RPF feature should be disabled for multipoint applications.

V.54 Diagnostics

V.54 loops are activated either by manual front panel push buttons or via the DTE interface. The push buttons and the DTE interface can be enabled or disabled separately by the SWITCH EN, ALB DTE, RLB DTE jumpers respectively. See *Setting Internal Jumpers and Switches* in *Chapter 2*, for more information.

Async to Sync Converter

ASM-20 has an internal asynchronous to synchronous converter and synchronous to asynchronous converter (used for asynchronous data).

A synchronous transmission is provided by internal conversion from asynchronous to synchronous mode in compliance with ITU V.22 bis. In this standard, the modem compensates for frequency deviation between the modem and the DTE by adjusting the length of the stop bit of the async character. If the modem's frequency is lower than the DTE, the local converter deletes one stop bit in every four (25%) or eight (12.5%)

characters. The remote converter will add a shorter stop bit (shorter by 12.5% or 25%) before sending the data to the remote DTE.

A suitable operation of the ASYNC to SYNC converter is selected by adjusting the proper character length and frequency deviation setting (dip switch bank), see *Figure 2-3* and *Table 2-2*.

X.21 Buffer (for X.21 interface)

To allow tail-end connection on an X-21 interface, a buffer is provided on received data. When ASM-20 is used in external clock configuration, set jumper JP2 to EXT. When internal or receive clock configuration is used, set the jumper to the opposite side. See *Appendix C, IR-X.21B Interface Module* for more information.

Test Pattern Generator and Receiver

This feature allows for easy and quick testing of the local modem as well as the communication link. When the PATT button on the front panel is activated, the circuit sends and checks a standard 511-bit pseudo random pattern. If errors are encountered, the ERROR LED remains ON or blinks.

The test can be carried out in local analog loopback, in remote digital loopback or in normal point-to-point operation opposite a remote ASM-20 modem. Press the PATT push button on the remote unit or connect a Bit Error Rate Tester which uses the standard 511-bit pattern.

X.21 External Clock Buffer Option

Available with X.21 interface model only. See *Appendix C, IR-X.21B Interface Module* for more information.

G.703 DTE Interface

Available with G.703 interface model only. See *Appendix B, IR-G.703 Codirectional Interface (64 kbps)* for more information.

1.4 Technical Specifications

Transmission Line

Type	Unloaded twisted pair 19 to 26 AWG
Range	See *Table 1-1*
Level	Strap-selectable to 0 dBm or -6 dBm
Transmit Impedance	150Ω or LOW (strap selectable)
Receive Impedance	150Ω or HIGH (strap selectable)
Return Loss	Greater than 15 dB
Carrier	Controlled by RTS or constantly ON
Modulation	Conditional diphase European Std. D1

Digital Interface

Type

- V.24/RS-232 via 25-pin D-type, (up to 64 kbps only), female connector
- V.35 via 34-pin female connector
- X.21 via 15-pin D-type female connector
- RS-530 (RS-422) via 25-pin D-type female connector
- V.36 (RS-449) via 37-pin female connector using mechanical cable adapter provided with the product
- G.703 Codirectional (64 kbps) via terminal block or RJ-45
- Built-in Ethernet bridge via RJ-45 connector or BNC

Data Rates - selectable

Sync:
19.2, 32, 48, 56, 64, 72, 96, 112, 128, 144, 192, 256 kbps

Async:
19.2, 28.8, 38.4, 57.6, 115.2 kbps

RTS/CTS Delay

Switch selectable to:
- 0 ms
- 9 ms
- 70 ms

Length of Word

8, 9, 10, 11

Stop Bits

1, 1.5, 2

Diagnostics
(Complies with the V.54 Standard)

Digital Loopback

- Local (DIG), activated by a manual switch
- Remote (REM), activated by a manual switch or by a control signal from the DTE interface connector

Analog Loopback

Local (ANA), activated by a manual switch or by a control signal from the DTE interface connector

Pattern

Test pattern activated by manual switch

Timing Elements

Receive Clock

Derived from the receive signal

Transmit Clock

Derived from 3 alternative sources:

- Internal oscillator
- External from the DTE
- Loop clock derived from the receive signal

Indicators	*Power*	PWR (green)
	Request to Send	RTS (yellow)
	Transmit Data	TD (yellow)
	Receive Data	RD (yellow)
	Data Carrier Detect	DCD (yellow)
	Test	TEST (red)
	Bit errors	Err (yellow)
Electrical	*Power Supply*	115 or 230 V (± 10%) 47 to 63 Hz; 5W -48 VDC or 24 VDC
Physical	*ASM-20 Modem*	Height: 44 mm / 1.7 in Width: 215 mm / 8.5 in Depth: 243 mm / 9.6 in Weight: 1.1 kg / 2.4 lb
	ASM-20-R Card	Dimensions: Fits ASM-MN-214 modem rack Weight: 290 gm / 10.1 oz
Environment	*Temperature*	0° - 50°C / 32° - 122°F
	Humidity	Up to 90%, non-condensing

Table 1-1 Approximate Range

Baud Rate	19 AWG (0.8 mm)		22 AWG (0.6 mm)		24 AWG (0.5 mm)		26 AWG (0.4 mm)	
kbps	km	miles	km	miles	km	miles	km	miles
256	3.75	2.3	2.85	1.75	2.25	1.4	1.9	1.2
192	6.0	3.7	4.5	2.8	3.5	2.2	2.7	1.7
144	10.6	6.6	6.75	4.2	4.5	2.8	3.4	2.1
128	12.4	7.7	7.3	4.5	5.0	3.1	3.6	2.2
115.2*	12.8	7.8	7.65	4.75	5.25	3.3	3.8	2.5
112	12.8	8.0	8.0	5.0	5.5	3.4	4.0	2.5
96	13.0	8.1	8.3	5.15	6.0	3.7	4.15	2.6
72	15.0	9.3	9.4	5.8	6.25	3.9	4.3	2.65
64	17.6	11.0	11.0	6.8	7.5	4.6	5.3	3.3
57.6*	18.8	11.7	11.75	7.3	8.0	5.0	5.6	3.5
56	18.8	11.7	11.75	7.3	8.0	5.0	5.6	3.5
48	19.4	12.0	12.2	7.6	8.25	5.2	5.8	3.6
38.4*	20	12.5	12.5	7.8	8.5	5.3	6.0	3.7
32	20.5	12.75	12.85	8.0	8.75	5.4	6.2	3.85
28.8*	20.5	12.75	12.85	8.0	8.75	5.4	6.2	3.85
19.2**	23.0	14.0	14.0	8.7	9.75	6.0	7.0	4.3

* *Async baud rate*

** *Sync / Async baud rate*

Chapter 2
Installation and Setup

2.1 Introduction

This chapter provides instructions for mechanical and electrical installation of the ASM-20 standalone model. For rack installation of the ASM-20, see *Chapter 5, Card Cage Version*.

Section 2.2 describes site preparation for ASM-20.

Section 2.3 lists the contents of the ASM-20 package.

Section 2.4 describes the mechanical installation of ASM-20.

Section 2.5 describes the electrical installation of ASM-20.

For ETH interface installation see *Appendix A, Ethernet Interface*.

For G.703 interface installation, see *Appendix B, IR-G.703 Codirectional Interface (64 kbps)*.

For X.21B interface installation, see *Appendix C, IR-X.21B Interface Module*.

For V.36 interface installation, see *Appendix E, Connection to RS-422*.

After installation has been completed, see *Chapter 3, Operation* for operating information and system checkout to assure normal operation.

2.2 Site Preparation and Prerequisites

Install ASM-20 within 1.5m (5 ft) of a grounded, easily accessible AC outlet. The outlet should be capable of furnishing 115 VAC or 230 VAC (depending on rated voltage of unit).

For DC units, the DC supply must be adequately isolated from the mains supply. To prevent a fire hazard, the line supply lead should be fused or current limited.

Allow at least 90 cm (36 in) of frontal clearance for operating and maintenance accessibility. Ensure that there is at least 10 cm (4 in) clearance at the rear of the unit for signal lines and interface cables.

2.3 Package Contents

The ASM-20 package includes the following items:

- ASM-20
- AC cord
- 48 VDC plug (optional)
- Adapter cable for the different interfaces (optional)
- ASM-20 Installation and Operation Manual.

2.4 Mechanical Installation

ASM-20 is a standalone device designed to be placed on a tabletop or bench. It is delivered completely assembled. No provisions are made for bolting ASM-20 to the tabletop.

2.5 Electrical Installation

The line and digital interface connectors (located on the rear panel of ASM-20) consist of a DTE interface connector and a five-screw terminal block. The DTE interface connector may be 34-pin for V.35 (see *Figure 2-1*), 15-pin for X.21 (see *Figure 2-2*) or 25-pin for RS-530/RS-422 or RS-232/V.24.

The terminal block provides a connection between transmit and receive twisted pair lines. The transmit and receive pairs are polarity insensitive. The transmit pair is connected to the terminals marked XMT, the receive pair is connected to the terminals marked RCV. If the cable is shielded, the shield may be connected to the terminal marked GND.

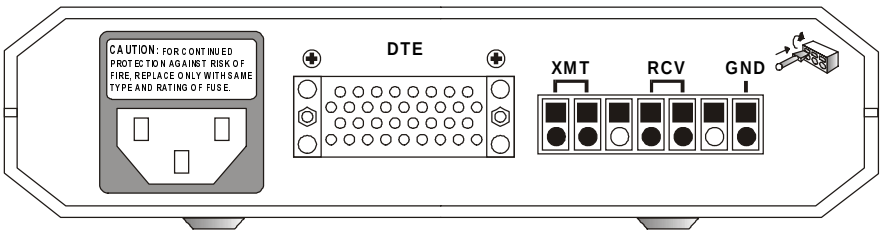


Figure 2-1 ASM-20 - V.35 Rear Panel

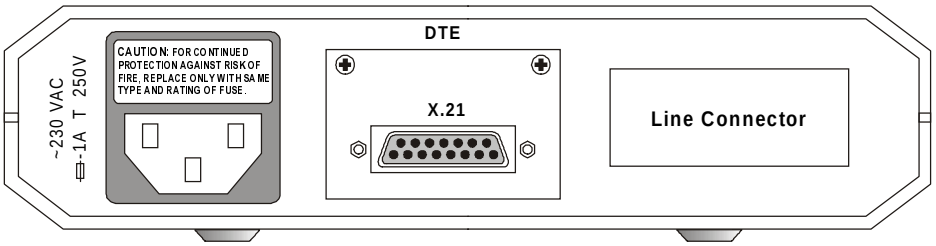


Figure 2-2 ASM-20 - X.21 Rear Panel

Strap Selection

Before connecting power to the unit, determine the required configuration of ASM-20 and position the straps accordingly. The PCB strap locations of *Figure 2-3* correspond to the numbers listed under the "Strap Identity" column in *Table 2-1*.

Warning

HIGH VOLTAGE

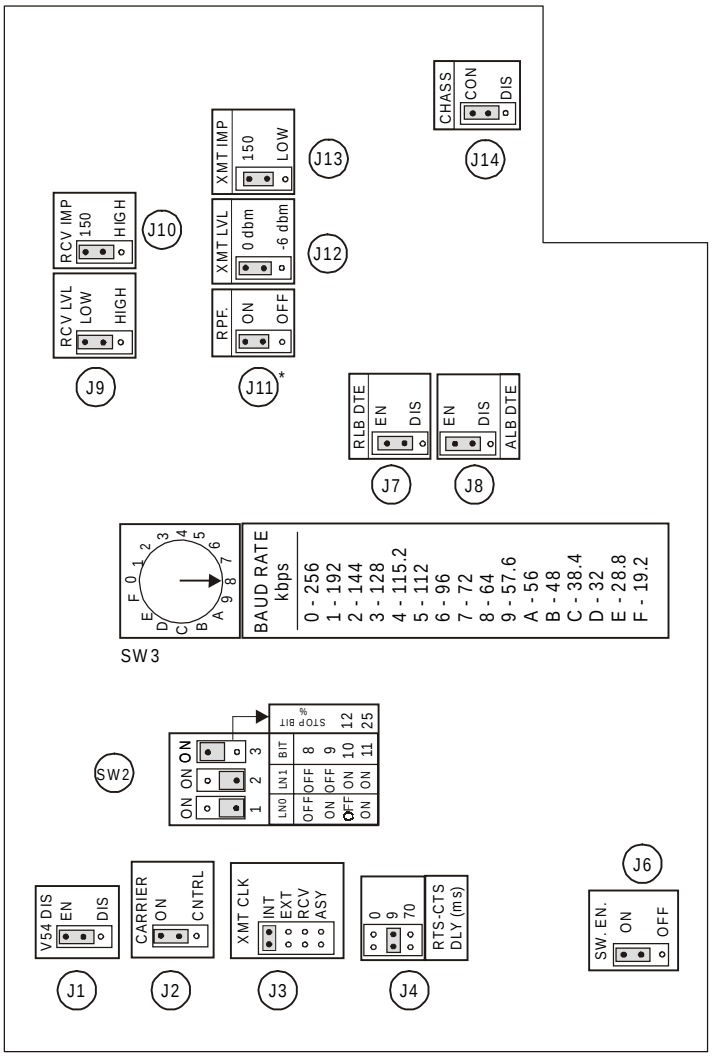
Only authorized and qualified service personnel should have access inside the equipment.

Disconnect the ASM-20 power cable and leased line connections before opening the top cover.

Setting Internal Jumpers and Switches

To set the jumpers and switches:

1. Disconnect the power cable.
2. Loosen the screws holding the bottom cover in place.
3. Remove the top cover.
4. Adjust the jumpers as required. See *Table 2-1*.
5. Replace the top cover and tighten the retaining screws.



** J11 - Only for standalone option*

Figure 2-3 PCB Layout Diagram

Warning

In certain locations where permanent excessive high voltages are present on the lines, disconnecting the signal ground from the chassis ground may render the unit unsafe for connection to unprotected telecommunication networks.

Note

For applications using an X.21 interface external clock (DTE timing source), connect the input clock to Pins 7(a) and 14(b) of the 15-pin connector.

In X.21, one of the modems should be set to RCV clock.

Table 2-1 specifies the strap selection settings. The jumper and switch identity numbers correspond to PCB Layout Diagram (see *Figure 2-3*).

Table 2-1 ASM-20 Strap Selection Settings

Jumper and Switch Identity	Function	Possible Settings	Factory Setting
J1 V54 DIS	Prevents activation of remote V.54 loops.	EN DIS	EN
J2 CARRIER	Selects the transmit carrier mode. When ON, transmit carrier is constantly ON. When CNTRL, transmit carrier is ON only when RTS is High. In X.21, RTS is replaced by the CONTROL signal.	ON CNTRL	ON
J3 XMT CLK	Selects the transmit timing signal from either: internal clock, external clock or receive clock and enables working in Asynchronous mode.	INT EXT RCV ASY	INT
J4 RTS-CTS DLY (ms)	Selects the delay between RTS and CTS.	0 9 70	9 msec
J6 SW. EN.	Enables activation of DIG, ANA and REM loopbacks via the front panel push buttons.	ON OFF	ON
J7 RLB DTE	Enables Remote Loopback command from the DTE.	EN DIS	EN
J8 ALB DTE	Enables Analog Loopback command from the DTE.	EN DIS	EN
J9 RCV LVL	Selects the receiver sensitivity level required.	LOW HIGH	LOW
J10 RCV IMP	Selects receive line impedance.	150Ω HIGH	150 Ω
J11 RPF*	Enables the Remote Power Failure feature.	ON OFF	ON
J12 XMT LVL	Selects the transmit output level to the line.	0 dBm -6 dBm	0 dBm
J13 XMT IMP	Selects the transmit line impedance.	150Ω LOW	150Ω
J14 CHASS	The CON setting connects Signal Ground to Chassis Ground. The DIS setting disconnects them.	DIS CON	CON

* *Only for standalone option*

Table 2-1 ASM-20 Strap Selection Settings (Cont.)

Jumper and Switch Identity	Function	Possible Settings	Factory Setting
SW2 ASYNC LENGTH (3 dip switches)	Select character length in async mode (see *Table 2-2* for further explanation).	S1 S2 No. Bits OFF OFF 8 ON OFF 9 OFF ON 10 ON ON 11	S1 = OFF S2 = OFF
	Selects the stop bit reduction rate to be used in async mode.	S3 OFF 25% ON 12.5%	S3 = ON
SW3 Baud Rate (kbps)	Selects the data rate.	Rate 0) 256 kbps 1) 192 kbps 2) 144 kbps 3) 128 kbps 4) 115.2 kbps $ 5) 112 kbps 6) 96 kbps 7) 72 kbps 8) 64 kbps 9) 57.6 kbps $ A) 56 kbps B) 48 kbps C) 38.4 kbps $ D) 32 kbps E) 28.8 kbps $ F) 19.2 kbps $$	64 kbps

$ *Async baud rate*

$$ *Async/Sync baud rate*

Table 2-2 Async Character Length Setting

Start Bit	Data Bits	Parity	Stop Bit	No. of Bits
1	5	NONE	2	8
1	6	NONE	1, 1.5, 2	8 9
1	6	ODD, EVEN	1, 1.5, 2	9 10
1	7	NONE	1, 1.5, 2	9 10
1	7	ODD, EVEN	1, 1.5, 2	10 11
1	8	NONE	1, 1.5, 2	10 11
1	8	ODD, EVEN	1, 1.5, 2	11

Power Connection

AC power is supplied to ASM-20 through a standard 1.5 m (5 ft) detachable power cord terminated by a standard 3-prong plug. The power inlet on the rear panel incorporates an integral fuse.

Before connecting AC power to this unit, the protective earth terminals of this unit must be connected to the protective ground connector of the (mains) power cord. The mains plug should only be inserted in a socket outlet provided with a protective earth contact. The protective action should not be negated by use of an extension cord (power cable) without a protective conductor (grounding).

Grounding: This unit will become dangerous if the protective (grounding) conductor (inside or outside the unit) is interrupted or if the protective earth terminal is disconnected.

An integral fuse is located above the AC mains socket on the rear panel. Make sure that only fuses of the required rating are used for replacement, as marked on the ASM-20 rear panel. Do not use repaired fuses or short circuit the fuse holder. Always disconnect the mains cable before removing or replacing the fuse.

If the fuse protection appears to have been damaged, render the unit inoperative and secure it against unintended operation.

Chapter 3
Operation

3.1 General

This chapter:

- Describes the controls and indicators of ASM-20 and their functions
- Explains the operation procedures
- Provides jumper and switch information.

Installation procedures given in *Chapter 2, Installation and Setup* must be completed and checked before attempting to operate the ASM-20.

3.2 Controls and Indicators

All controls (push button switches) and LED indicators are located on the ASM-20 front panel. Their functions are described in *Table 3-1* and correspond to the identification numbers in *Figure 3-1* and *Figure 3-2*.

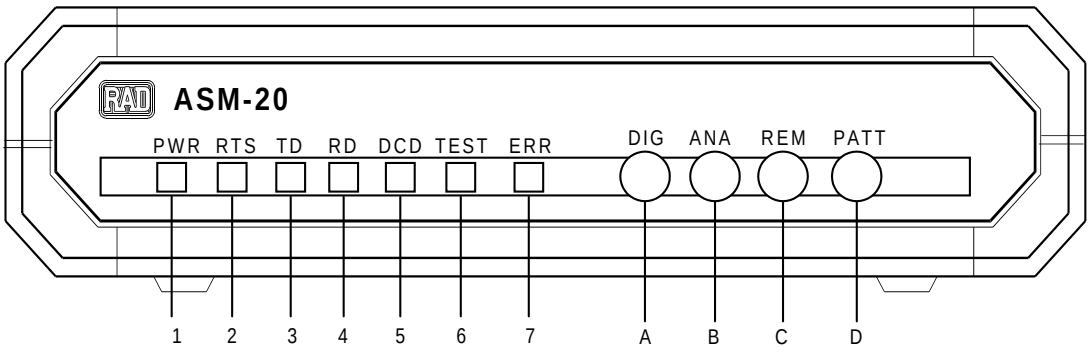


Figure 3-1 ASM-20/SA Front Panel

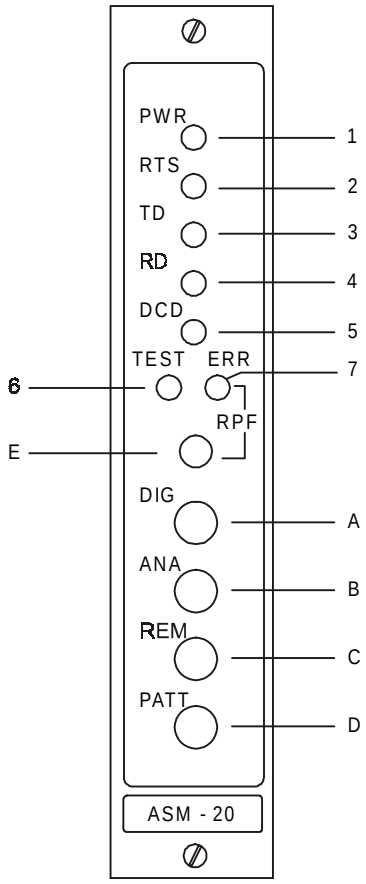


Figure 3-2 ASM-20R Front Panel

Table 3-1 Control and Indicator Functions

Item	Name	Type	Function
A	DIG	Pushbutton	The Digital Loopback switch causes the local ASM-20 to loop received data and clock back to its transmitter. Data Set Ready will turn off (see *Figure 4-5*).
B	ANA	Pushbutton	The Analog Loopback (V.54 Loop 3) switch causes the local ASM-20 to loop its transmitter output back to its receiver (see *Figure 4-3*). This loopback may also be activated from the DTE when DTE COMMAND ALB strap is set to EN.
C	REM	Pushbutton	The Remote Digital Loopback (V.54 Loop 2) switch causes the remote ASM-20 to loop received data and clock to its transmitter (see *Figure 4-4*). Data Set Ready will turn off. This loopback may be also activated from the terminal when DTE COMMAND RLB strap is set to RLB EN.
D	PATT	Pushbutton	The PATT switch causes the ASM-20 to send and receive a 511 test pattern. If errors are encountered,, the ERROR LED is ON or blinks. Receive Data and Clear to Send will turn off. **Note**: The CARRIER jumper should be set to ON; if set to CNTRL, the RTS signal must be high.

Table 3-1 Control and Indicator Functions (Cont.)

Item	Name	Type	Function
E	RPF RESET	Pushbutton	Resets ERR/RPF LED (only available in ASM-20/R).
1	PWR	LED Indicator	Green LED is on when power is on.
2	RTS	LED Indicator ITU 105	Yellow LED is on when terminal activates Request to Send.
3	TD	LED Indicator ITU 103	Yellow LED is on when steady SPACE is being transmitted. It flickers when data is transmitted.
4	RD	LED Indicator ITU 104	Yellow LED is on when steady SPACE is being received. It flickers when data is received.
5	DCD	LED Indicator ITU 109	Yellow LED is on when a valid receive signal is present.
6	TEST	LED Indicator ITU 142	Red LED is on when the ASM-20 is in any of the three loopback modes or PATT mode.
7	ERR/RPF	LED Indicator	ERR: Yellow LED goes ON momentarily when PATT switch is activated and then goes out. If there are errors in the test pattern, the LED blinks or remains ON. RPF: Indicates power failure in remote standalone units (ASM-20/R only). Reset by depressing RPF reset push button.

3.3 Operating Instructions

ASM-20 operates entirely unattended, except when the occasional monitoring of LED indicators is required.

Power On Procedure

Apply AC power by connecting the AC power cord to an acceptable AC source. The PWR LED should light up, indicating that the ASM-20 is on. If the local and remote ASM-20 units are in operation and passing data, the following indicator conditions will exist:

- PWR: On
- RTS: On or Flashing
- TD: Flashing or Off
- RD: Flashing or Off
- DCD: On or Flashing
- TEST: Off.

If you do not obtain the above LED indications following initial power on, check that the three test push buttons are not depressed.

Activation of Tests

In order to verify that the ASM-20 is operating correctly, use the internal BERT and analog loopback tests as described in *Bit Error Rate Tester (BERT)* in *Chapter 4* and *Local Test - Analog Loopback* in *Chapter 4*.

Operational Jumper and Switch Changes

If you need to reconfigure the ASM-20 for a different type of operation, the jumpers and switches must be changed to correspond to the new operating mode.

Only authorized or qualified personnel should have access inside the equipment. Disconnect the ASM-20 power cable before opening the top cover.

For guidance in repositioning the jumpers and switches, refer to *Electrical Installation* in *Chapter 2*. The equipment will become unsafe for connection to telecommunication networks in some locations, if the signal ground is disconnected from the chassis ground.

Power Off Procedure

To turn off the AC power to the ASM-20, simply remove the AC power cord from the AC source.

Chapter 4

Troubleshooting and Diagnostics

4.1 General

This chapter contains procedures for performing system diagnostic tests for ASM-20. Use the test procedures provided in this chapter to:

- Verify normal system operation
- Isolate faulty equipment in the event of failure.

Tests are activated by control push buttons on the ASM-20 front panel and monitored via LED indicators. For a description of the ASM-20 controls and indicators and their functions, see *Chapter 3, Operation*.

4.2 Frequently Asked Questions

Q. How is the new version of ASM-20 different from the older version?

A. ASM-20 has been improved in order to get CE mark approval and has some new features. A different ordering name, ASM-20-2, was given to the newer version. Presently, any order received for ASM-20 or ASM-20-2 will be delivered as ordered until the stock of existing ASM-20 products is depleted. After the stock is depleted, orders for any version will be delivered with the new ASM-20-2 boards only.

The following table describe the differences between the old ASM-20 and the new version.

Table 4-1 Differences in Versions

ASM-20	ASM-20-2
Non-modular interfaces (V.24, X.21 etc.); part of the main board	Modular interfaces
Two ordering options for synchronous rates: 32 kbps - 128 kbps 32 kbps - 144 kbps	All synchronous rates from 19.2 kbps - 256 kbps.
No Ethernet support	Ethernet built-in bridge

Table 4-1 Differences in Versions (Cont.)

ASM-20	ASM-20-2
Metal box	Plastic box
Terminal block with screws	Clip terminal block
Main chip RJ008 and external BERT chip	Main chip RJ016 which includes BERT chip
No CE mark	CE mark
No asynchronous transmission	Asynchronous transmission capability

The above versions are compatible with each other within similar synchronous rates.

Additionally, the ASM-20-2 has been improved in order to get a better line surge protection. In many cases line surges are caused by lightening strikes. The improved line protection of ASM-20-2 complies with the ITU-T/K.21 standard.

The line interface has been modified by adding two Gas surge protection diodes and another two Transorber surge protection diodes. The Gas diodes protect against line surges above 300V and the Transorber diodes protect against surges below 300V.

4.3 Loop Tests Procedure

The test switches and LED indicators built into ASM-20 allow rapid checking of the data terminals, ASM-20 and lines. Use the test procedures provided in this chapter to check normal system operation and isolate faulty equipment in the event of failure. Each test verifies the operational performance of a unit in the system or provides a positive indication of equipment failure.

Before testing operation of the data system equipment and line circuits, ensure that all units are turned on and correctly configured.

4.4 Bit Error Rate Tester (BERT)

The Bit Error Rate Tester (BERT) can be activated in any diagnostics test in which the test pattern transmitted is looped back to the BERT for comparison (see *Figure 4-1*).

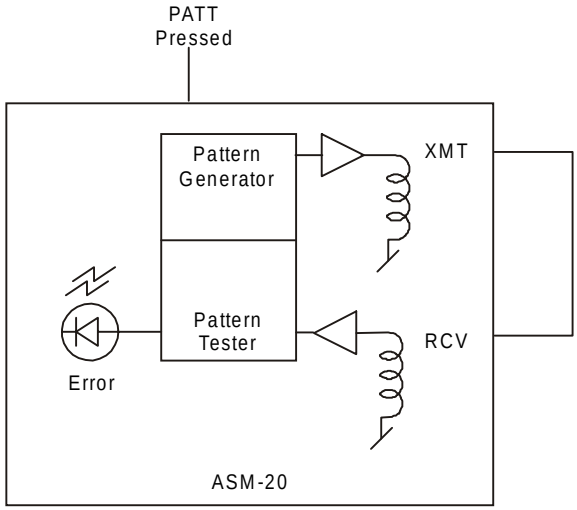


Figure 4-1 BERT Using Loops

Alternatively, the complete link can be tested when using two ASM-20 modems or an external BERT. *Figure 4-2* illustrates the two options for testing a complete link:

- Press the PATT push button of the local modem and check the ERR/RPF LED. At the remote side check an external BERT.
- Press the PATT push button of the local and remote modems and check their ERR LEDs.

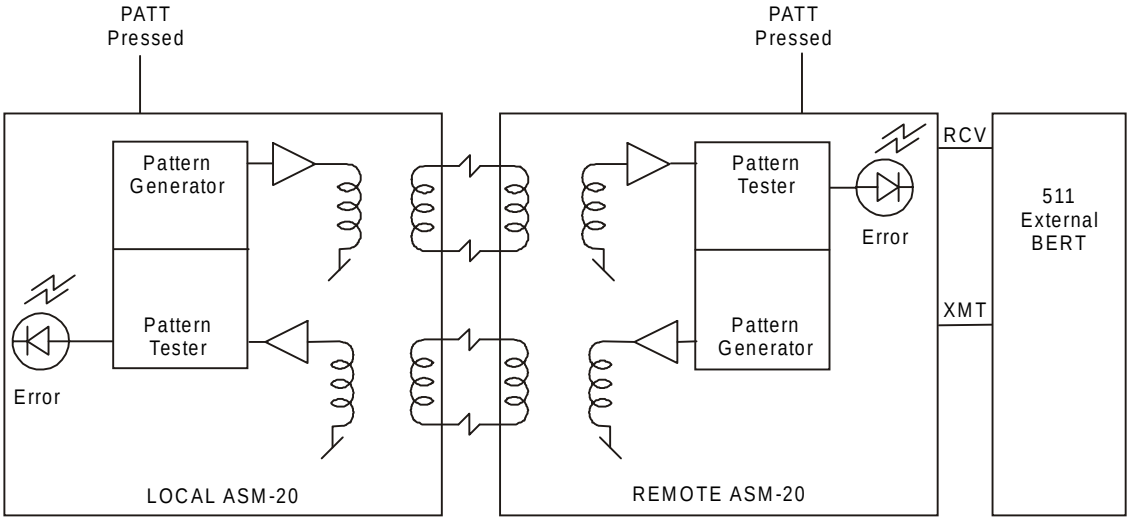


Figure 4-2 Two BERTs Operating End-to-End

4.5 Modem Self Test

The modem self test verifies that ASM-20 is operating correctly.

To verify that ASM-20 is operating correctly:

1. Press the ANA (Analog Loopback) push button on the front panel. Both the TEST and DCD LEDs should light up. If the DCD LED does not light up, check that the CARRIER jumper is ON or that the RTS signal is ON (high).
2. Press the PATT push button. Verify that:
   - DCD LED is still lit up
   - TEST LED is still lit up
   - ERR LED lights up for a short period.

   The ERR LED should then turn off. If it lights up or blinks, then ASM-20 is faulty and should be replaced. If the test executes correctly, restore all the push buttons and jumpers to the required position.

4.6 Local Test - Analog Loopback

This test checks the performance of the local modem, the local data terminal and the cables connecting them. Perform it separately at the local and remote sites.

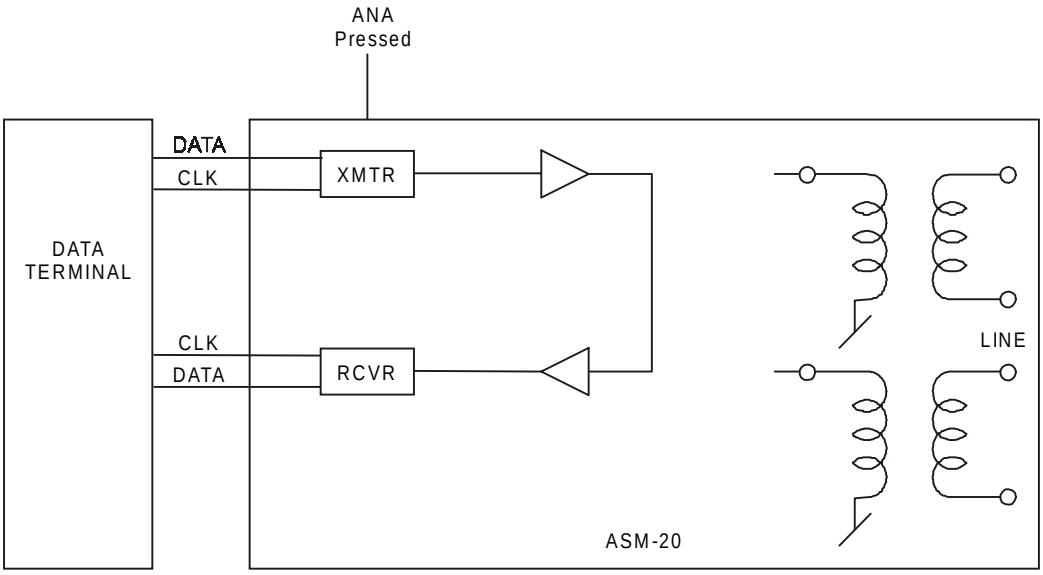


Figure 4-3 Local ASM-20 in Analog Loopback

To check the performance of the local modem and the local data terminal:

1. Press the ANA (Analog Loopback) push button on the front panel (see *Figure 3-1*). This test can also be activated via the pin on the DTE interface. See *Table 2-2* for more information. The TEST LED should turn on. ASM-20 transmit output is now connected to its own receiver (see *Figure 4-3*).
2. Check that the DTE is operating properly and can be used for a test. If a fault is indicated, call a technician or replace the unit.
3. Execute the test using one of the methods described below:
   - Use the DTE and check the echoed data stream
   - Use an external Bit Error Rate Tester (BERT) unit
   - Use the internal Bit Error Rate Tester (BERT). Press the PATT push button. The ERR LED will light up briefly to indicate that the LED is functioning. If any bit error is encountered, the LED will blink or remain ON.
4. Perform Step 3 at both ends. If the BERT test equipment does not indicate a fault, but the data terminal does, follow the manufacturer's test procedures for the data terminal and check that the cable connecting the terminal and ASM-20 is working. After completion of the test (or when the fault has been corrected), restore the ANA push button to the OFF position by pressing the ANA push button again. Proceed to *Communication Link Tests* below.

4.7 Communication Link Tests

Remote Digital Loopback

This test determines the performance of the local and remote ASM-20, and the lines connecting them.

To check the performance of the local and remote ASM-20:

1. Press the REM (Remote Loopback) push button, providing a loopback at the remote ASM-20 (see *Figure 4-4*). (This test can also be activated via the pin on the DTE interface.) The TEST LED should light up at both the local and remote units.
2. Perform the BERT test using one of the methods described below:
   - Use the DTE and check the echoed data stream
   - Use an external Bit Error Rate Tester (BERT) unit
   - Use the internal Bit Error Rate Tester (BERT). Press the PATT push button. The ERR LED will light up briefly to indicate that the LED is functioning. If any bit error is encountered the LED will blink or remain ON.

3. If Step 2 indicates a fault, and if the modem test described *Modem Self Test* on *page 4-4* was positive for both the local and remote modems, the line circuits are not operating properly.

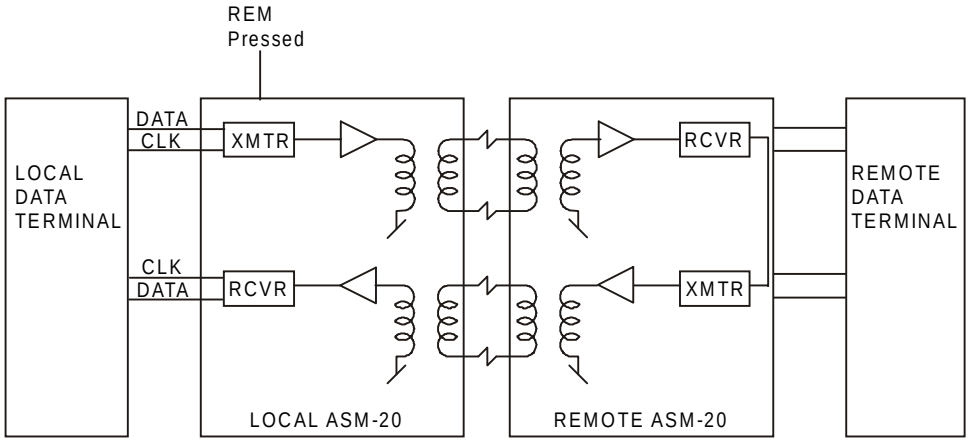


Figure 4-4 Remote ASM-20 in Digital Loopback

Local Digital Loopback

This test is activated by pressing the DIG push button. It loops the received data back to the remote ASM-20. (This test is equivalent to activating the remote loopback from the remote ASM-20 - see *Figure 4-5*). The operator at the remote end can determine the performance of the local and remote ASM-20 units, and the lines between them.

Note *The modem with the pressed DIG push button must be in RCV or ASY mode*

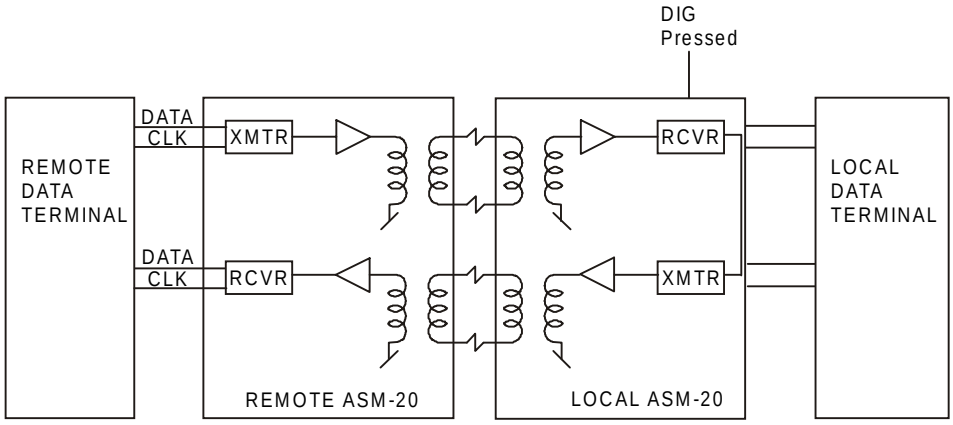


Figure 4-5 Local ASM-20 in Digital Loopback

Chapter 5
Card Cage Version

5.1 General

This chapter describes the ASM-20/R card version, designed for installation in the ASM-MN-214 card cage. The chapter contains the following sections:

- Section 5.2 describes the ASM-MN-214 card cage
- Section 5.3 describes the ASM-20/R card version
- Section 5.4 describes the power supply to ASM-20/R
- Section 5.5 describes how to install ASM-20/R.

5.2 ASM-MN-214 Card Cage

The ASM-MN-214 card cage contains one or two power supplies and up to 14 plug-in cards. The card types can be ASM-20/R or other RAD rack version modems/converters - any combination of up to 14 plug-in cards.

For each of the 14 cards, the rear panel (see *Figure 5-1*) contains a male connector for the terminal block and a DB-25 connector. A protection cover protects the terminal block connectors.

The terminal block (see *Figure 5-1*) is to be attached to the rear panel terminal block connectors. It contains screws for connecting the transmit and receive pairs and ground, if present.

The 25-pin D-type female interface connector provides all interface signals for the digital interfaces. Modems with X.21 or V.35 interface require an external mechanical adapter. Two optional interface attachments, CIA/V.35/1 and CIA/X.21, can be ordered separately from RAD. CIA/X.21 converts two adjacent DB-25 connectors to two X.21 15-pin connectors. CIA/V.35/1 converts one DB-25 connector to a V.35 34-pin connector. V.36 modem cards are supplied with a RAD adapter cable CBL 530/449F, which converts the DB-25 connector to a V.36 37-pin connector. The adapter cable and two interface attachments are also shown in *Figure 5-1*.

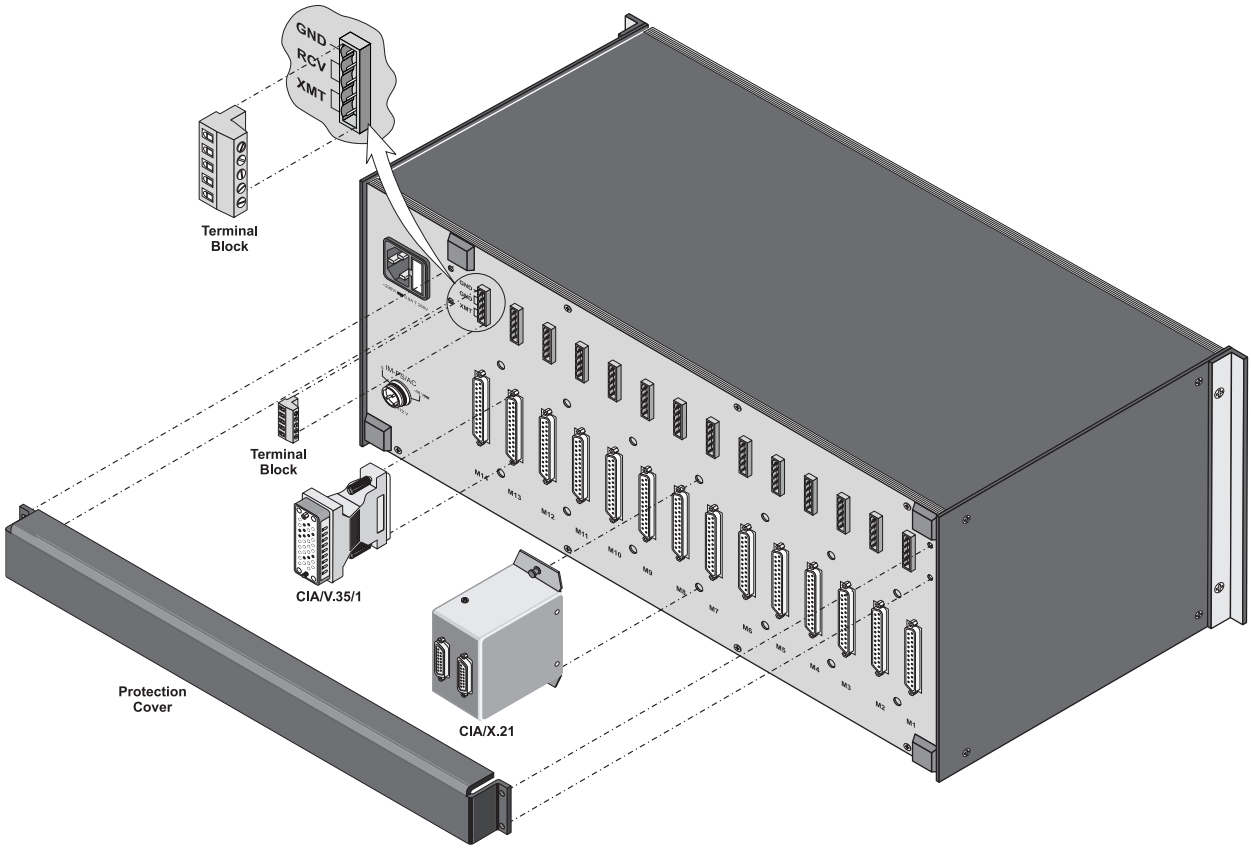


Figure 5-1 ASM-MN-214 Rear Panel

5.3 ASM-20/R Card Version

Figure 5-2 shows the ASM-20/R card front panel. The LEDs and switches of the card version are identical in their functionality to those of the standalone device. For this information, refer to *Section 3.1, Controls and Indicators*, in *Chapter 3*.

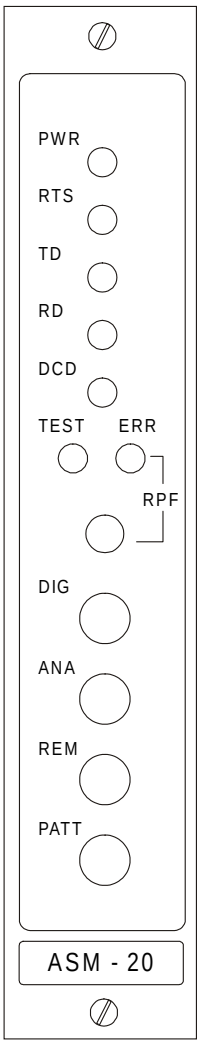


Figure 5-2 ASM-20/R Front Panel

5.4 Power Supply

Power is supplied to the ASM-20/R card from the ASM-MN-214 power supply via the chassis. Each ASM-20/R card has two fuses, which protect the entire system against power failure resulting from a short circuit in one card.

The ASM-MN-214 card cage can accept both AC or DC power supplies. LED indicators located on the ASM-MN-214 front panel (see *Figure 5-3*) show activity when the power supply is connected to the mains plug. The power supply supports the full card cage with any combination of cards.

AC Supply (100, 115 or 230 VAC)

The AC power supply of the ASM-MN-214 is 100, 115 or 230 VAC, ±10%, 47 to 63 Hz.

DC Supply (-48 VDC)

The DC power supply is -36 to -72 VDC. It uses a DC/DC converter module to provide the power required for the cards.

Power Supply with Redundancy

This special ordering option is equipped with two separate power supplies, operating together and sharing the load of the whole card cage. If either of the power supplies fails, the other one will continue to supply power to the full card cage.

Two LED indicators show activity of each power supply. They should both light when mains power is provided.

Note *It is possible to combine AC and DC power supplies in the same cage.*

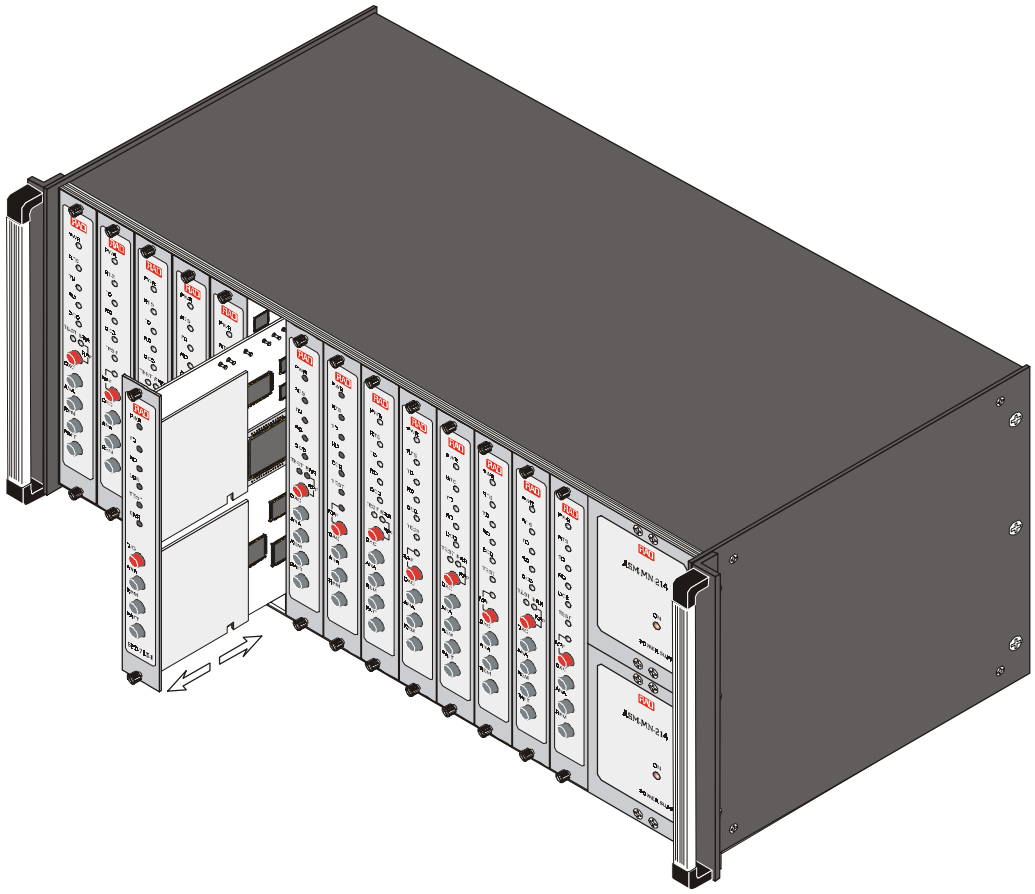


Figure 5-3 ASM-MN-214 Front Panel

5.5 Installation

To install the ASM-20/R card in the ASM-MN-214 card cage:

1. Install the ASM-MN-214 card cage in the 19" rack.
2. Adjust the jumpers and switches on the card as required (see *Table 2-1* and *Figure 2-3* in Chapter 2).
3. Insert the ASM-20/R card into one of the ASM-MN-214 slots. Push the bottom of the card into the cage to until it is fully inserted into the edge connector inside the rack. Tighten the screws on the top and on the bottom of each card.
4. Remove the protection cover from the terminal block connectors.
5. Connect the terminal block to the ASM-MN-214 terminal block connector.
6. Connect the line to the terminal block as follows: connect transmit pair to the terminals marked XMT, the receive pair to the terminals marked RCV, and the fifth screw to ground (optional).
7. If required, attach the appropriate CIA (CIA/X.21 or CIA/V.35/1) or V.36 adapter cable to the DB-25 connector on the card cage rear panel.
8. Connect the DTE cable to the DB-25 connector, other side of CIA or adapter cable (depending on your version of the card interface).
9. Connect power to the ASM-MN-214 card cage:
   - To connect AC power, connect the power cable to the mains supply.
   - To connect DC power, refer to *DC Power Supply Connection Supplement*.

Appendix A
Ethernet Interface

A.1 General

This appendix:

- Describes the IR-ETH for RAD modems
- Describes the different IR-ETH connector options
- Lists the Ethernet bridge specifications
- Explains how to install and operate an Ethernet bridge.

A.2 Description

The IR-ETH is an interface module for RAD modems, used for converting the Ethernet (10BaseT or 10Base2) electrical levels to the modem TTL levels. It also converts the Ethernet protocol to HDLC to enable long distance transmission and avoid the Ethernet collision limitation.

The IR-ETH includes an internal, self-learning Ethernet bridge, which enables a high performance link between two Ethernet segments at a low transmission rate. The low-speed HDLC transmission is sent over the link using the modem modulation technique. It is converted back to an Ethernet signal at the remote modem.

Figure A-1 shows a typical application using an Ethernet interface bridge. Each modem is connected to an Ethernet network via the Ethernet Interface bridge.

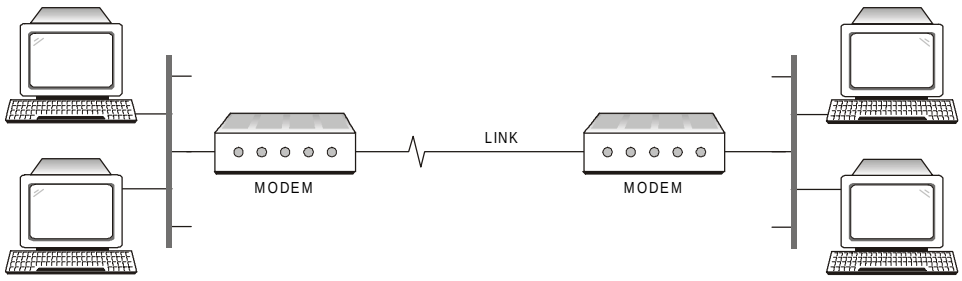


Figure A-1 Ethernet Interface Typical Application

A.3 IR-ETH Connector Options

Figure A-2 and *Figure A-3* show the rear panel of ASM-20 with the IR-ETH connector options. The IR-ETH connector for the ASM-20/R card (rack mount version) is shown in *Figure A-4*.

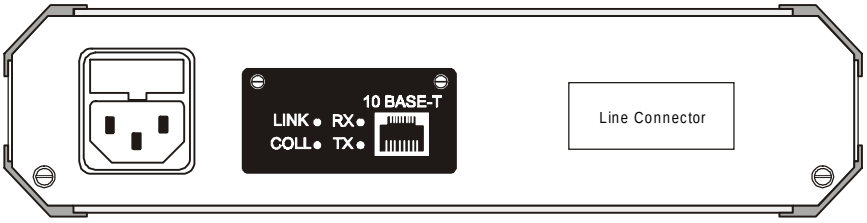


Figure A-2 ASM-20 Rear Panel with IR-ETH/UTP Connector Option

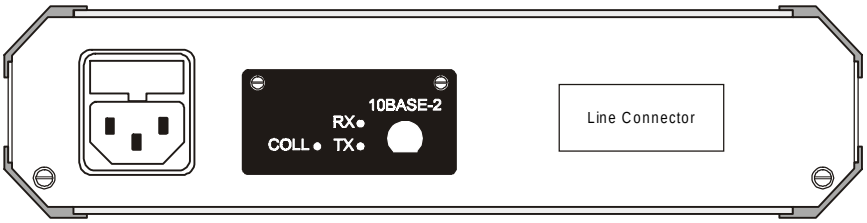


Figure A-3 ASM-20 Rear Panel with IR-ETH/BNC Connector Option

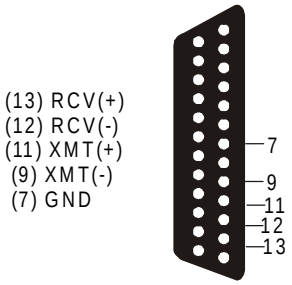


Figure A-4 IR-ETH Connector for the ASM-20 Rack-Mount Version

When using the RJ-45 connector, the customer must prepare a mechanical cable for adapting the DB-25 pinout to that of RJ-45. The pinouts of the DB-25 and RJ-45 connectors are given in *Table A-1*.

Table A-1 DB-25 and RJ-45 Pin Assignment for IR-ETH Connection

Signal	Pin	
	DB-25	**RJ-45**
RCV (+)	13	3
RCV (-)	12	6
XMT (+)	11	1
XMT (-)	9	2
GND	7	-

A.4 Ethernet Bridge Specifications

General	*LAN Table*	10,000 addresses
	Filtering and Forwarding	15,000 pps
	Buffer	256 frames
	Delay	1 frame
LAN	*Standard*	Conforms to IEEE 802.3/Ethernet
	Data Rate	10 Mbps (20 Mbps 10BaseT FDX)
	Connectors	10BaseT (UTP): Shielded RJ-45 10Base2: BNC connector
WAN	*Protocol*	HDLC
	Data Rate	According to the modem transmission rate

A.5 Installation and Operation

Figure A-5 and *Figure A-6* show the Ethernet bridge layout, the locations of the DIP switches, and the rear panel components for the UTP and the BNC versions, respectively.

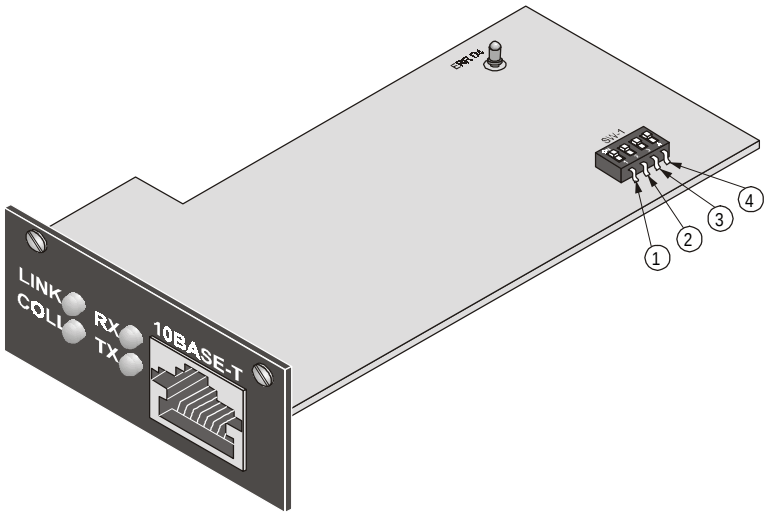


Figure A-5 Ethernet Bridge Layout (UTP Option)

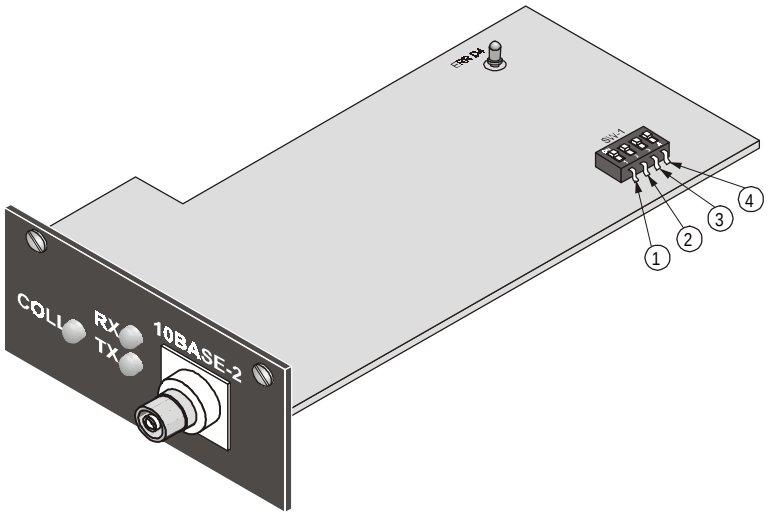


Figure A-6 Ethernet Bridge Layout (BNC option)

LAN Installation

For 10BaseT installation, either a straight cable or a cross-cable may be required. Use a cross-cable when connecting to a port that does not implement the crossover function internally. Otherwise, use a straight cable. (Hubs usually implement the crossover function internally while NICs and other devices do not.)

Switch Settings

Set switches according to *Table A-2*.

Table A-2 DIP Switches Settings

Switch Number	Name	Description	Default Setting
1	SQ/FD	ON: Ethernet full-duplex mode OFF: Ethernet half-duplex mode	OFF
2	CMP	ON: Strips padding bits inserted in 64-byte frame OFF: Transmits frames over WAN as is	ON
3	FIL	ON: Passes only frames destined for another LAN OFF: Disables LAN filter; passes all frames transparently	ON
4	(nc)		OFF

Note *The SQ/FD switch is not used in the Ethernet bridge with the BNC connector option.*

LED Indicators

Table A-3 lists the IR-ETH LED indicators and describes their functions.

Table A-3 IR-ETH Bridge LED Indicators

LED Name	Description	Location	Color
LINK	ON indicates good link integrity (available only in the 10BaseT version)	Panel	Green
COLL	ON indicates collision on the attached Ethernet segment	Panel	Yellow
RX	ON when data is received from the Ethernet attached segment	Panel	Yellow
TX	ON when data is transmitted from the modem to the Ethernet segment	Panel	Yellow
ERR D4	Bridge buffer overrun	On board	Red

Appendix B

IR-G.703 Codirectional Interface (64 kbps)

B.1 Introduction

This appendix:

- Provides a general description of the IR-G.703 codirectional interface (64 kbps)
- Describes the EXT mode for the IR-G.703 codirectional interface (64 kbps)
- Describes the INT/RCV mode for the IR-G.703 codirectional interface (64 kbps).

B.2 General Description

The IR-G.703 is an interface module for RAD modems, converting G.703 codirectional signals to TTL levels. The converted data is sent over the modem link using the modem modulation technique and converted back at the other end into G.703 64 kbps codirectional signals, or into any other digital interface signal possible. The module is available in the following two versions:

- **The Standalone version** fits into a standalone modem and is available with two types of physical connections: a terminal block or an RJ-45.
- **The Rack version** is mounted on the rack version modem card and uses the modem edge connector for communication. The edge connector is wired, on the motherboard of the card cage, to the DB-25 connector on the back plane of the ASM-MN-214 card cage. *Figure B-1* illustrates the pinout of the different connectors.

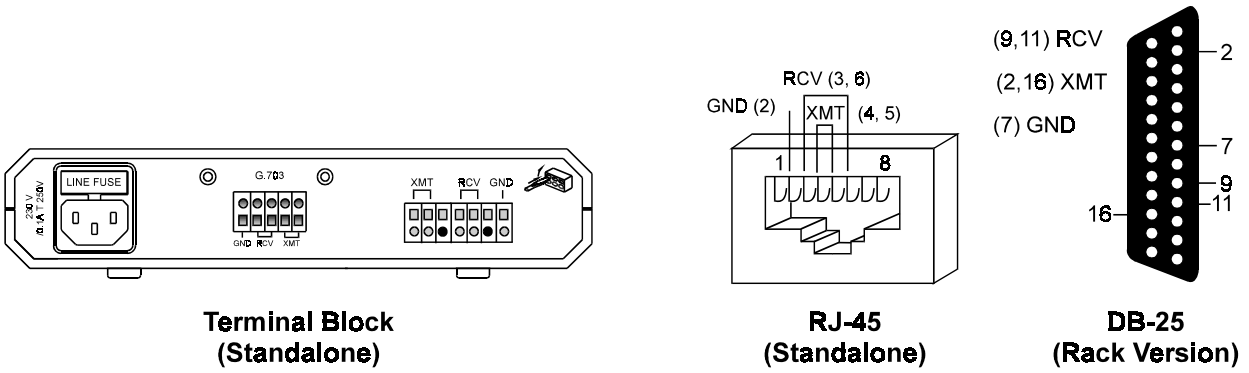


Figure B-1 IR-G.703 Connector Options

Note *In Figure B-1, RCV refers to the input signals to the IR module; XMT refers to the output signals from the module.*

The IR-G.703 interface module is shown in *Figure B-2*. It has two operation modes which are selectable on the PCB board. The selection is made by means of the JP1 jumper located within the module as shown in *Figure B-2*. The EXT mode is described in *EXT Mode* on *page B-2* and illustrated by *Figure B-3*. The INT/RCV mode is described in *INT/RCV Mode* on *page B-3* and illustrated by *Figure B-4*.

Note *The IR-G.703 interface should be in accordance with the modem clock mode. For example, if the modem is in the EXT mode, then JP1 should be set to the EXT position.*

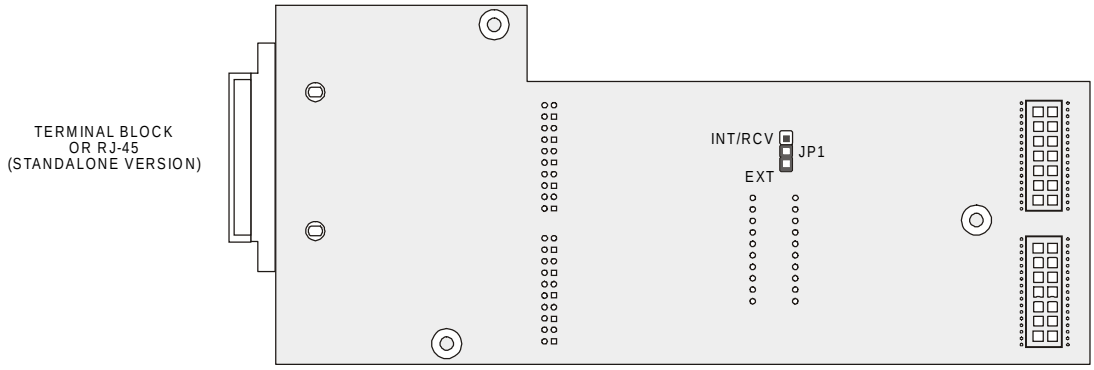


Figure B-2 Location of JP1 on the IR-G.703 Interface Module

B.3 EXT Mode

This mode is used in applications, where the system timing is provided by the G.703 network. The IR-G.703 module has an internal buffer to compensate for the phase delay introduced to the system by the line delay between the two modems. The buffer is an 8-bit FIFO connected as shown in *Figure B-3*.

This mode corresponds to the modem clock working in the EXT mode.

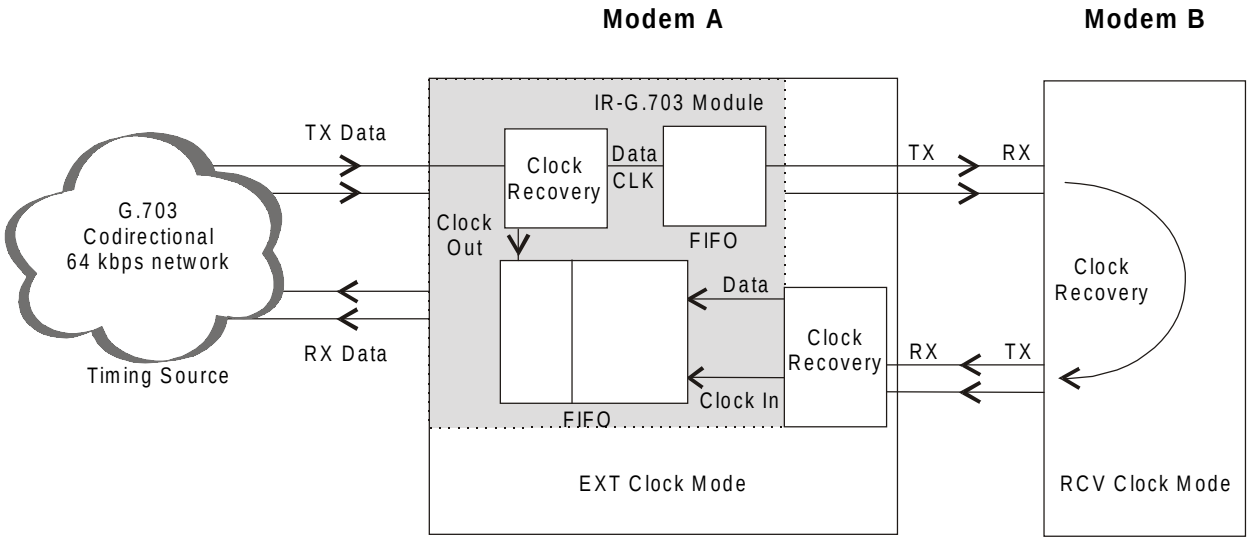


Figure B-3 IR-G.703 EXT Mode Timing Block

B.4 INT/RCV Mode

This mode is used in applications where the G.703 codirectional 64 kbps equipment connected to the modem recovers the clock signal from the modem link. This mode is used mainly when the attached equipment has a G.703 codirectional interface, but is not able to produce clock signals. The module has a 8-bit FIFO buffer to compensate for the phase delay introduced by the G.703 device. *Figure B-4* illustrates the buffer connection and the required application setup.

This mode corresponds to the modem clock working in the INT or RCV mode.

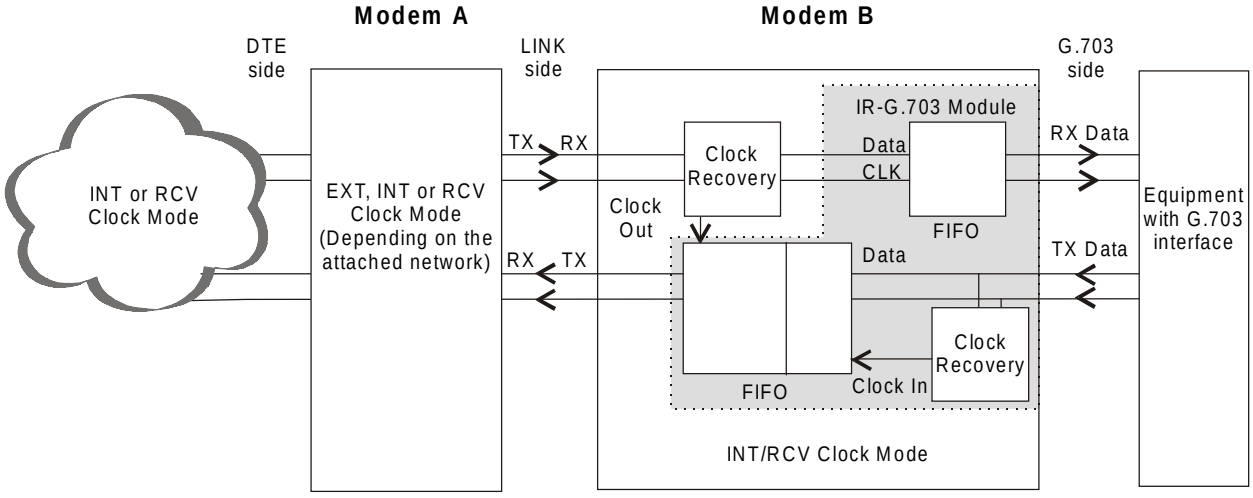


Figure B-4 IR-G.703 INT/RCV Mode Timing Block

Appendix C
IR-X.21B Interface Module

C.1 General

This appendix:

- Provides a general description of the IR-X.21B interface module
- Describes the IR-X.21B connectors and pin assignments
- Describes the IR-X.21B interface module
- Describes the EXT mode for the IR-X.21B
- Describes the INT/RCV mode for the IR-X.21B.

C.2 General Description

The IR-X.21B is an interface module for RAD modems, converting X.21 signals to TTL levels. The converted data is sent over the modem link, using the modem modulation technique, and is converted back at the other end into X.21 signals, or into any other digital interface signal.

Figure C-1 shows a typical application of the ASM-20 standalone modem with the IR-X.21B interface module.

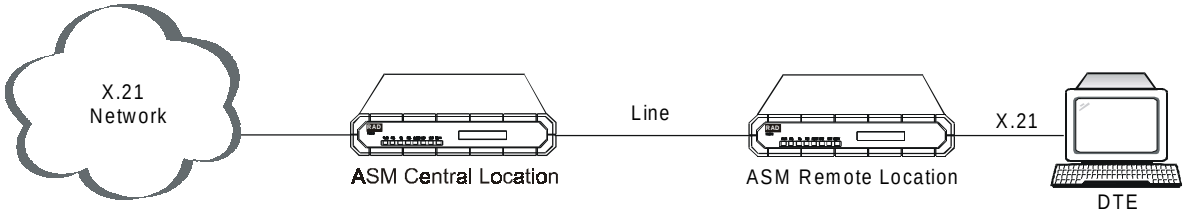


Figure C-1 Typical ASM-20 X.21 Application

C.3 IR-X.21B Connectors

Figure C-2 shows the rear panel of a standalone ASM-20 with the IR-X.21B interface module.

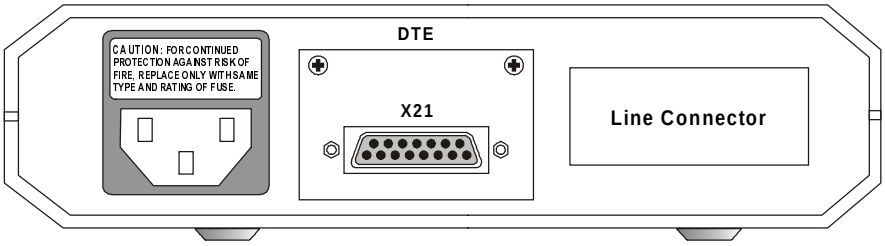


Figure C-2 ASM-20 Rear Panel with X.21 Connector

The ASM-20 modem rack version requires an additional adapter to connect between the DB-15 connector of the X.21 equipment to the DB-25 connector of the ASM-MN-214 modem rack. For this purpose, an optional DB-15 attachment CIA/X.21 can be ordered separately from RAD. The attachment connects to the ASM-MN-214 rear panel as shown in *Figure 5-3* for the CIA/V.35 attachment.

Pin Assignment

Table C-1 shows the X.21 DB-15 pin assignment.

Table C-1 IR-X.21B DB-15 (RS-422) Connector Pin Assignment

Pin	ID	Function
1	Shield	Chassis connection
2	A	Transmit signal A
3	A	Control A
4	A	Receive A
5	A	Indication A
6	A	Signal timing A
7	A	External Timing
8	GND	Common
9	B	Transmit B
10	B	Control B
11	B	Receive B
12	B	Indication B
13	B	Signal Timing B
14	B	External Timing

C.4 IR-X.21B Interface Module

The IR-X.21B interface module is shown in *Figure C-3*. It has two operation modes which are selectable on the PCB board. The selection is made by means of the JP2 jumper located within the module as shown in the figure. The EXT mode is described in *EXT Mode* on *page C-3* and illustrated in *Figure C-4*. The INT/RCV mode is described in *INT/RCV Mode* on *page C-4* and illustrated in *Figure C-5*.

Note *The X.21 interface should be in accordance with the modem clock mode. For example, if the modem is in the EXT mode, then JP2 should be set to the EXT position.*

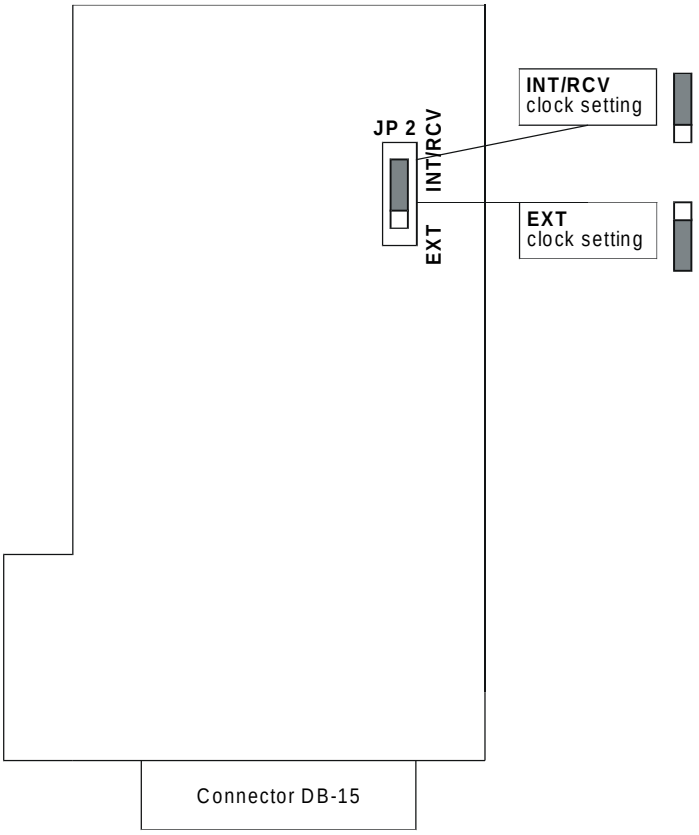


Figure C-3 Location of Jumper JP2 in the IR-X.21B Interface Module

C.5 EXT Mode

This mode is used in applications of X.21 networks where the system timing is provided by the X.21 network. The IR-X.21B module has an internal buffer to compensate for the phase delay introduced to the system by the line delay between the two modems. The buffer is a 16-bit FIFO connected as shown in *Figure C-4*. When the modem's clock mode is EXT, the JP2 jumper must be set to EXT.

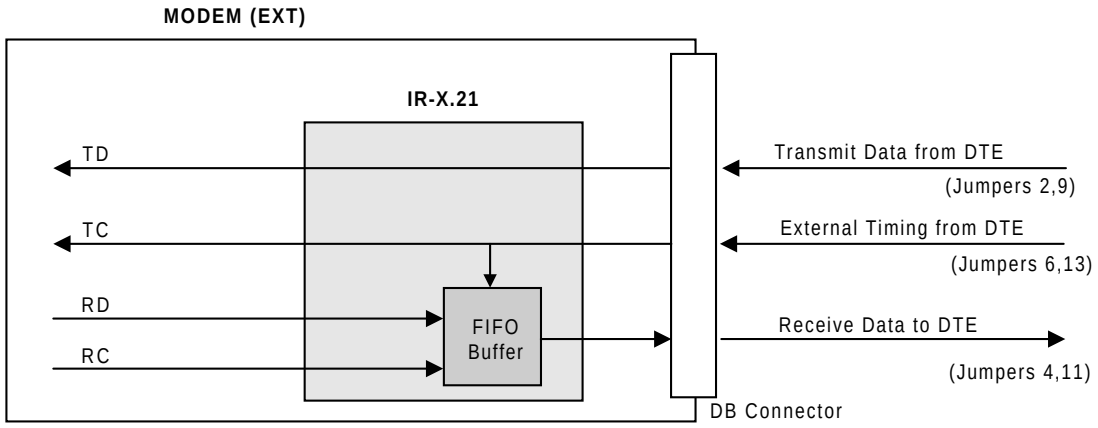


Figure C-4 EXT Mode Timing Block

C.6 INT/RCV Mode

This mode is used in applications where the IR-X.21B side uses the clock signal from the modem link. This mode is used mainly when the attached equipment has an IR-X.21 interface, but no ability to produce clock signals. The module has a 16-bit FIFO buffer to compensate for the phase delay introduced by the X.21 device. *Figure C-5* illustrates the buffer connection and the required application setup. When the modem's clock mode is INT or RCV, the JP2 jumper must be set to INT/RCV (see *Figure C-3*).

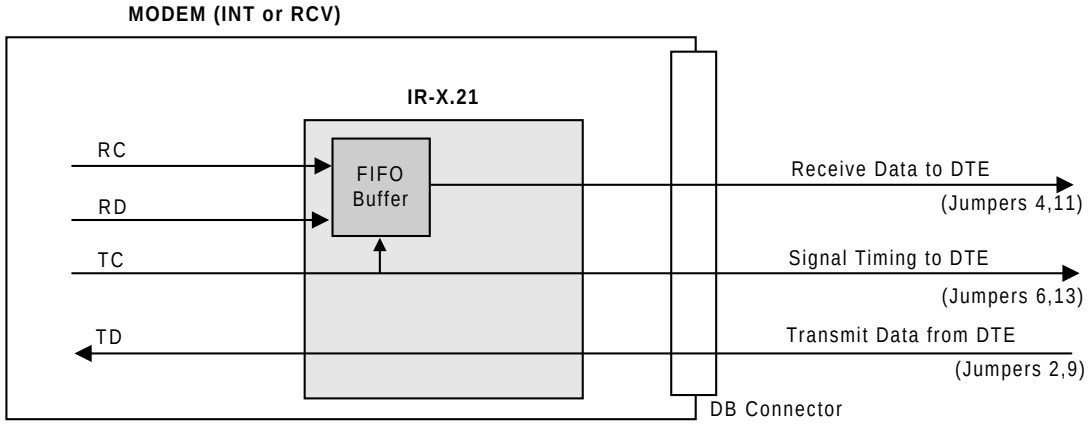


Figure C-5 INT/RCV Mode Timing Block

Appendix D
DTE Interface Connectors

D.1. General

Table D-1 provides detailed information about each DTE interface connector.

Table D-1 Interface Signal List (Female Connectors) Pins and Standard Signal Names

	RS-232	V.35		EIA-530		X.21		
Signal Function	**DB-25 Stand-alone and Frame**	**DB-25 Frame**	**34-pin Standalone**	**DB-25 Standalone and Frame**		**DB-25 Frame**	**DB-15 Standalone**	**Description**
			Pin Circuit	**Pin**	**Circuit**		**Pin Circuit/ (Function)**	
Protective Ground	1	1	A Frame 101	1		1	1 - [SHIELD]	Chassis ground. May be isolated from Signal Ground. See *Table 2-1*.
Signal Ground	7	7	B Signal Ground 102	7	AB	7	8 - [GND]	Common Signal and DC power supply ground.
Transmitted Data	2	11 9	S TD(B) 103 P TD(A) 103	2 14	BA(A) BA(B)	2 14	2 T(A) 9 T(B) [TRANSMIT]	Serial digital data from DTE. The data transitions must occur on the rising edge of the transmit clock.
Received Data	3	12 13	R RD(A) 104 T RD(B) 104	3 16	BB(A) BB(B)	3 16	4 R(A) 11 R(B) [RECEIVE]	Serial digital data at the output of the modem receiver. The data transitions occur on the rising edge of the receive clock.

Table D-1 Interface Signal List (Female Connectors) Pins and Standard Signal Names (Cont.)

	RS-232	V.35		EIA-530	X.21		
Signal Function	**DB-25 Stand-alone and Frame**	**DB-25 Frame**	**34-pin Standalone Pin Circuit**	**DB-25 Standalone and Frame Pin Circuit**	**DB-25 Frame**	**DB-15 Standalone Pin Circuit/ (Function)**	**Description**
Request to Send	4	4	C RTS 105	4 CA(A) 19 CA(B)	4 19	3 C(A) 10 C(B) [CONTROL]	A positive level to the ASM-20 when data transmission is desired.
Clear to Send	5	5	D CTS 106	5 CB(A) 13 CB(B)			A positive level from the ASM-20 with delay, after receipt of Request to Send, and when the ASM-20 is ready to transmit.
Data Set Ready	6	6	E DSR 107	6 CC(A) 22 CC(B)			A positive level from the ASM-20 when the power is on, and the ASM-20 is (a)not in the DIGITAL LOOP mode, or (b) has not received a REMOTE LOOPBACK signal from the remote unit.
Data Terminal Ready	20	20	H DTR 108	20 CD(A) 23 CD(B)			Not used.
Carrier Detect	8	8	F DCD 109	8 CF(A) 10 CF(B)	8 10	5 I(A) 12 I(B) [INDICATION]	A positive level from the ASM-20, except when a loss of the received signal is detected, or when Data Set Ready is negative.

Table D-1 Interface Signal List (Female Connectors) Pins and Standard Signal Names (Cont.)

	RS-232	V.35		EIA-530	X.21		
Signal Function	**DB-25 Stand-alone and Frame**	**DB-25 Frame**	**34-pin Standalone Pin Circuit**	**DB-25 Standalone and Frame Pin Circuit**	**DB-25 Frame**	**DB-15 Standalone Pin Circuit/ (Function)**	**Description**
External Transmit Clock	24	19 16	U SCTE(A) 113 W SCTE(B) 113	24 DA(A) 11 DA(B)	24 11	7 (A) 14 (B)	A serial data rate clock input from the data source. Positive clock transitions must correspond to data transitions.
Transmit Clock	15	14 10	Y SCT(A) 114 A SCT(B) 114	15 DB(A) 12 DB(B)	15 12	6 S(A) 13 S(B) [SIGNAL TIMING]	A transmit data rate clock for use by an external data source. Positive clock transitions correspond to data transitions.
Receive Clock	17	22 23	X SCR(B) 115 V SCR(A) 115	17 DD(A) 9 DD(B)			A receive data clock output for use by external data sink. Positive clock transitions correspond to data transitions.
Local Analog Loop	18	18	L and j 141	18 LL			A control signal input; when on, commands the ASM-20 into Local Analog Loopback (V.54 Loop 3). See *Table 2-2*.
Remote Loopback	21	21	N and h 140	21 RL			A control signal input; when on, commands the ASM-20 to send a remote Loopback command (V.54 Loop 2) to the remote ASM-20. See *Table 2-2*.

Table D-1 Interface Signal List (Female Connectors) Pins and Standard Signal Names (Cont.)

	RS-232	V.35		EIA-530	X.21		
Signal Function	**DB-25 Stand-alone and Frame**	**DB-25 Frame**	**34-pin Standalone Pin Circuit**	**DB-25 Standalone and Frame Pin Circuit**	**DB-25 Frame**	**DB-15 Standalone Pin Circuit/ (Function)**	**Description**
Test Indicator	25	25	n and k 142	25 TM			A control signal output from the ASM-20; positive during any test mode.

Appendix E
Connection to RS-422

E.1 General

Table E-1 provides detailed information for connecting an ASM-20 (EIA 530) to a RS-422 (V.36) DTE.

Table E-1 Interface List for Connecting ASM-20 (RS- 530) to RS-422 (V.36) DTE

Signal Function	RS-449 (RS-422/423)		EIA 530	
	37 Pins		DB-25 Female Standalone and Frame	
	Pin	Circuit	Pin	Circuit
Protective Ground	1	Shield	1	
Signal Ground	19	SG	7	AB
DTE Common Return	37	SC		
DCE Common Return	20	RC		
Transmitted Data	4 22	SD (A) SD (B)	2 14	BA (A) BA (B)
Received Data	6 24	RD (A) RD (B)	3 16	BB (A) BB (B)
Request to Send	7 25	RS (A) RS (B)	4 19	CA (A) CA (B)
Clear to Send	9 27	CS (A) CS (B)	5 13	CB (A) CB (B)
Data Set Ready	11 29	DM (A) DM (B)	6 22	CC (A) CC (B)
Data Terminal Ready	12 30	TR (A) TR (B)	20 23	CD (A) CD (A)
Carrier Detect	13 31	RR (A) RR (B)	8 10	CF (A) CF (B)
External Transmit Clock	17 35	TT (A) TT (B)	24 11	DA (A) DA (B)
Transmit Clock	5 23	ST (A) ST (B)	15 12	DB (A) DB (B)

Table E-1 Interface List for Connecting ASM-20 (EIA 530) to RS-422 (V.36) DTE (Cont.)

Signal Function	RS-449 (RS-422/423)		EIA 530	
	37 Pins		DB-25 Female Standalone and Frame	
	Pin	Circuit	Pin	Circuit
Receive Clock	8 26	RT (A) RT (B)	17 9	DD (A) DD (B)
Local Analog Loopback	10	LL	18	LL
Remote Loopback	14	RL	21	RL
Test Indicator	18	TM	25	TM

Appendix F
Unit Case Assembly

F.1 General

This appendix:

- Describes the unit case
- Describes how to install the unit case into a 19″ rack.

F.2 Unit Case

The unit case design facilitates quick access to the interior strappings as well as easy installation into a 19" rack.

F.3 Installation of the Unit Case into a 19" Rack

The height of the unit is 1U (1.75"); the width of the unit is slightly less than half the available mounting width. A rack adapter kit, RM-17, is available for installing either a single unit or two units side by side in the 19" rack.

Caution Disconnect AC power before opening the unit.

Installation of a Single Unit

Rack adapter components for installing a single unit include one short bracket and one long bracket. Each bracket is fastened to the side walls of the unit by two screws (with flat washers) which are inserted into the two front holes on the side wall (The unit is supplied with nuts already in place on the inner side wall). Note that the short bracket fastens to the left side of the unit, and the long bracket to the right side of the unit. See *Figure F-1*.

Once the brackets are fastened to the side walls, the unit is ready for installation in the 19" rack. Place the unit in the rack and fasten the brackets to the side rails of the rack by means of the two screws situated on each side (not included in the kit).

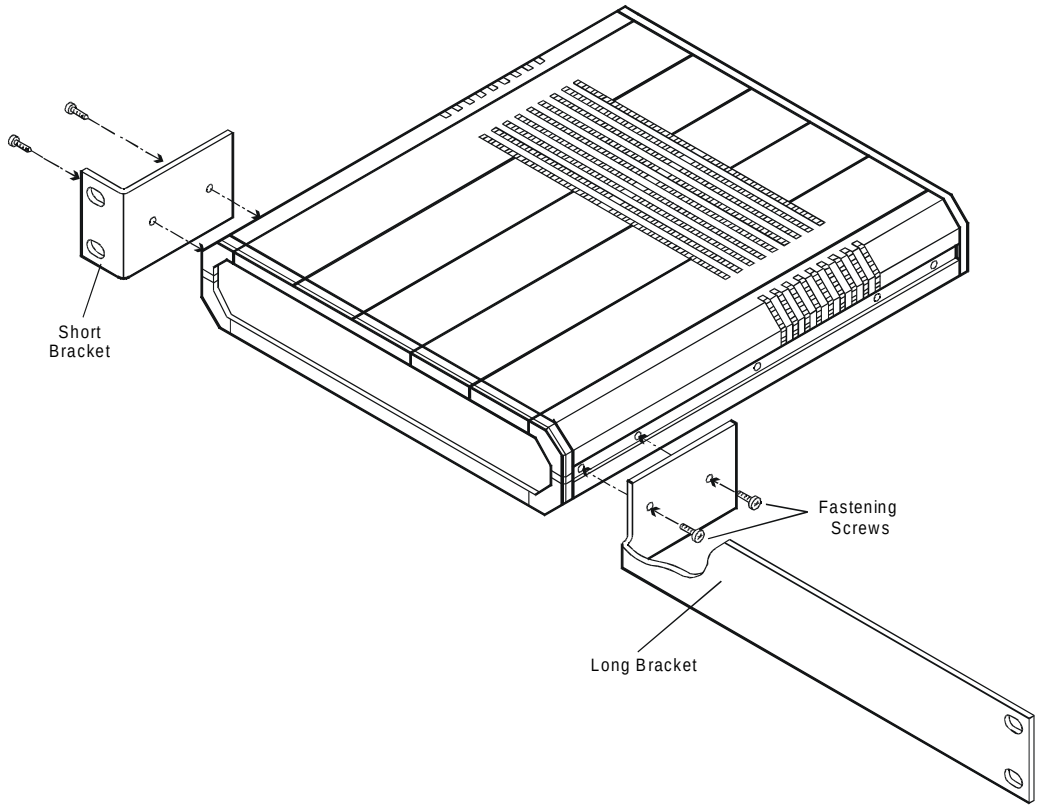


Figure F-1 Installation of a Single Unit

Installation of Two Units

Rack adapter components for installing two units include two long side rails (one for each unit) which slide one into the other fastening the two units together, and two short side brackets which hold the two units in the 19" rack. See *Figure F-2*.

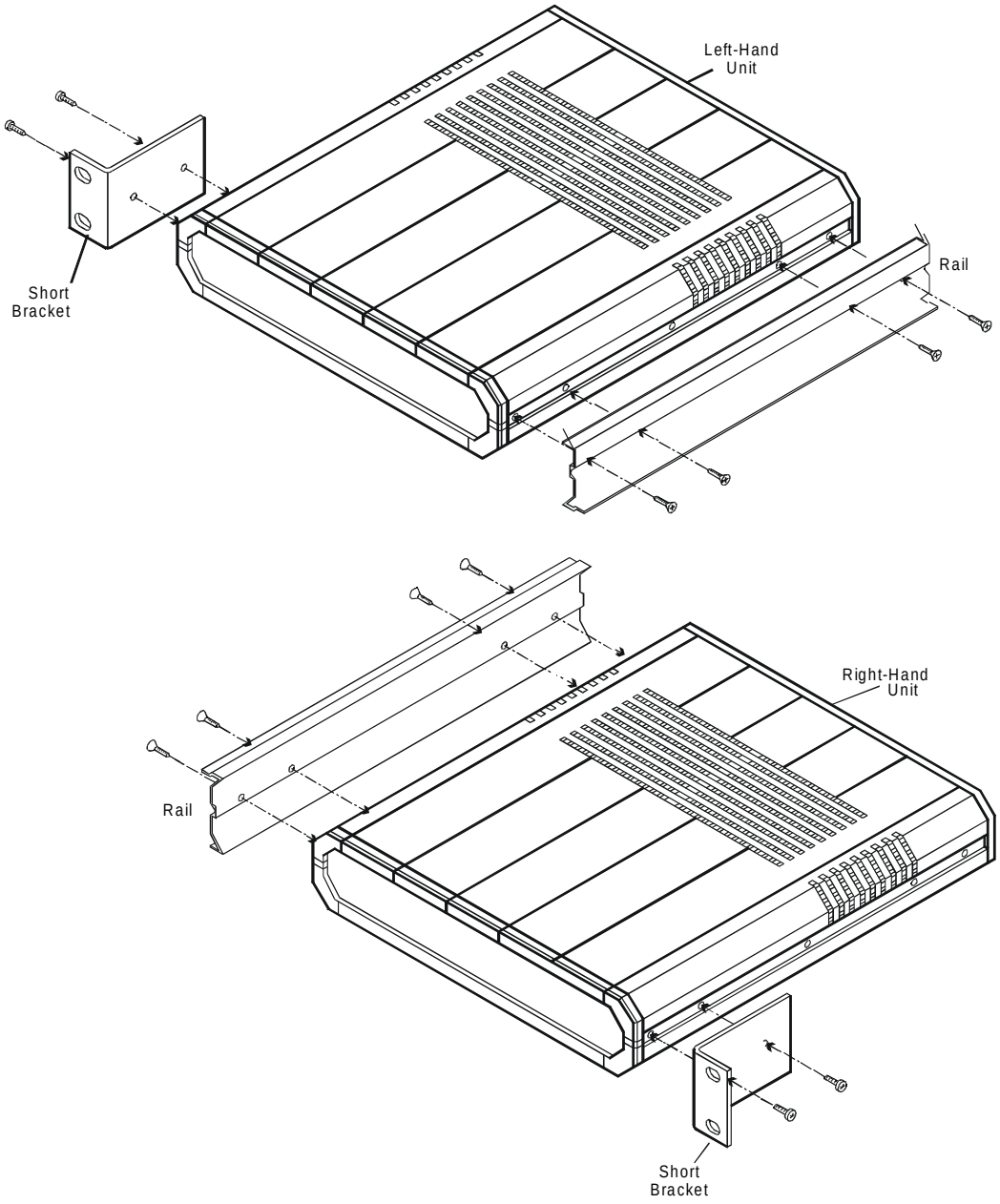


Figure F-2 Rack Adapter Components for Installation of Two Units

To install two units:

1. Fasten one long side rail to each unit (right side to one unit, left side to the other unit) using the four screws and flatwashers supplied. The side rails must be attached in opposing fashion, the narrow flange of the first rail opposite the wide flange of the second rail.
2. Attach one short bracket opposite the side rail on each unit using the four screws and flatwashers supplied.
3. Slide the side rail of one unit into the side rail of the other unit, fastening the two units together (See *Figure F-3*).

4. Secure the supplied plastic caps to the ends of the rails, to prevent the units moving and to protect the rail ends.
5. Place the assembled units in the rack and fasten the brackets to the side rails of the rack, by means of the four screws situated on each side (not included in the kit).

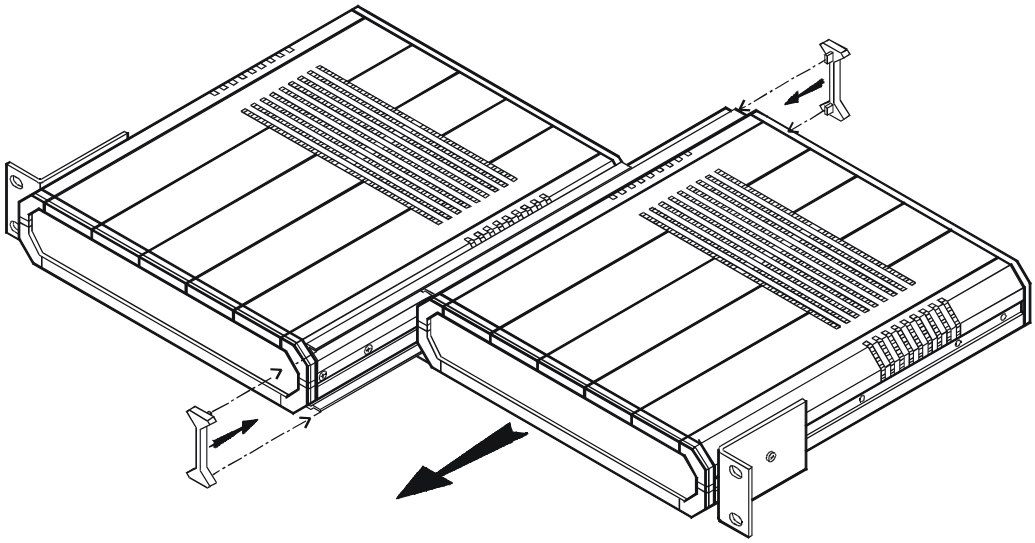


Figure F-3 Installation of Two Units